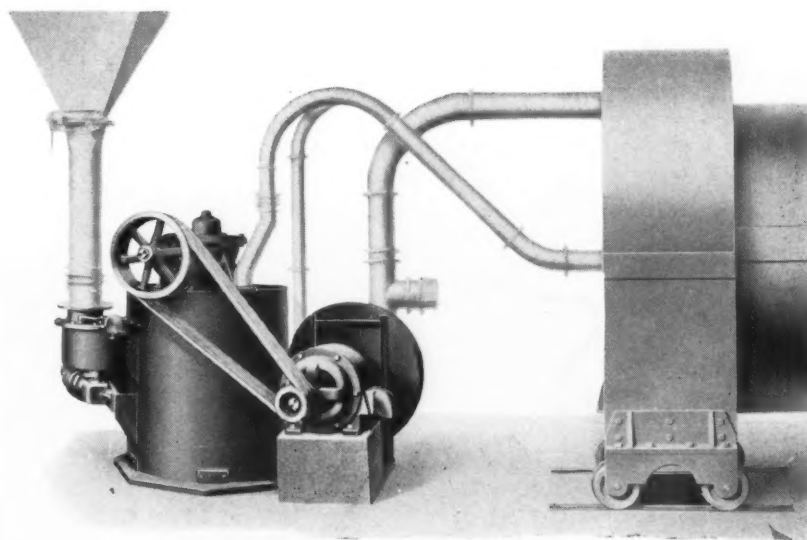
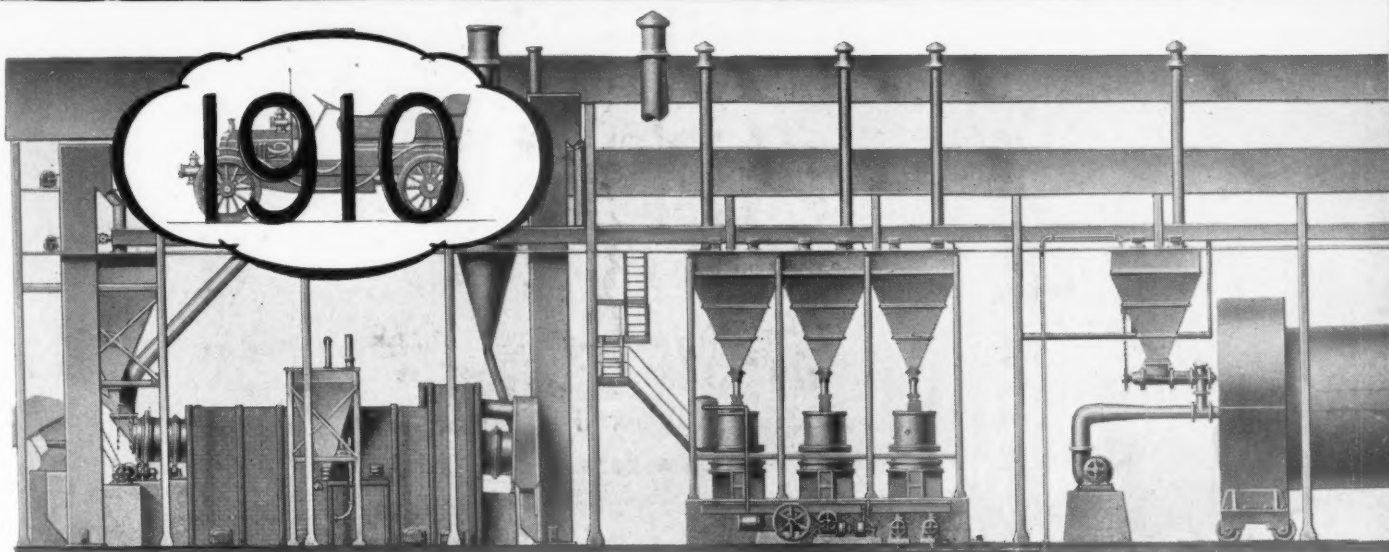


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and
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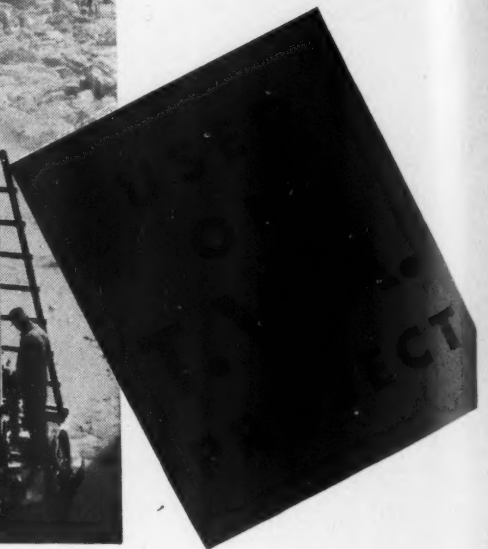
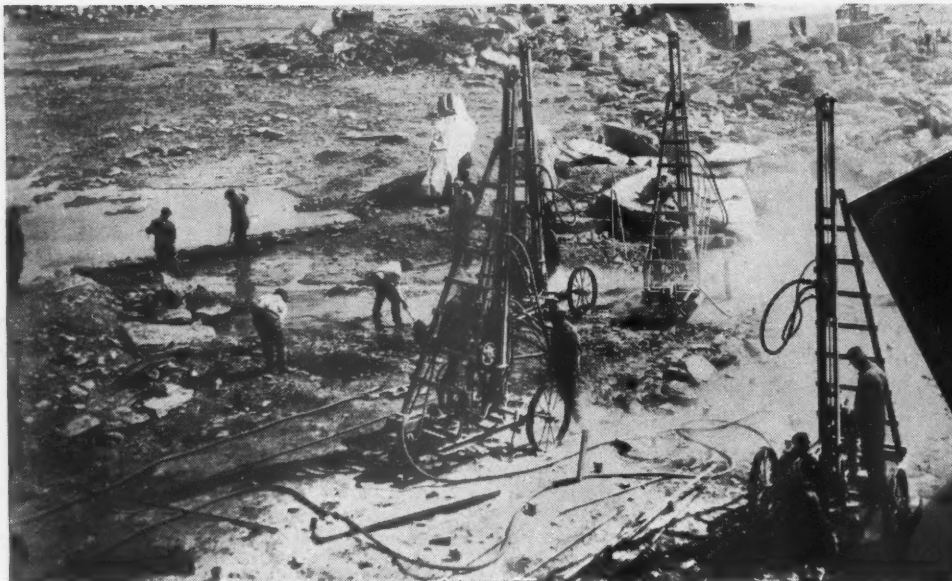
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Condor

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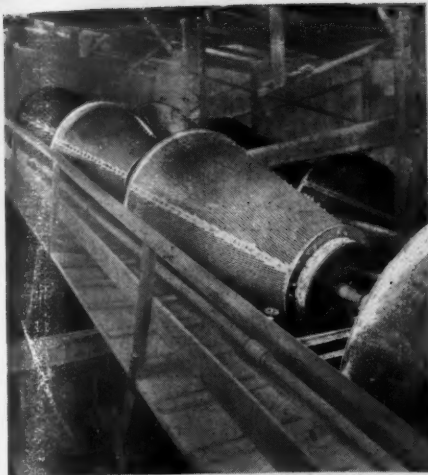
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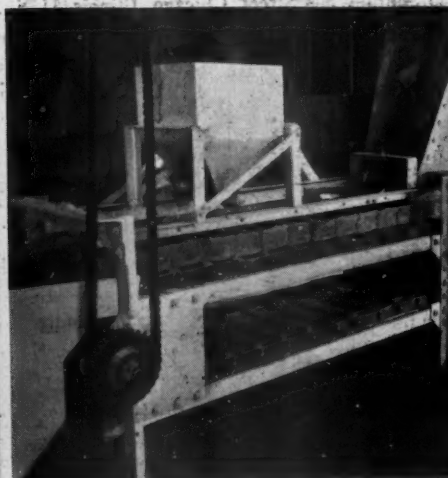
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(Published Monthly—Except January, Semi-Monthly)

July, 1935

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Building
the Chinese Wall
would have been much
safer with
**MONARCH WHYTE
STRAND**

**This Triple-Feature Wire Rope
makes good on today's toughest jobs**

- 1. High Stamina** — assured by careful heat treating and drawing of each individual wire.
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AD NO. 172

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"Best Ever Used"

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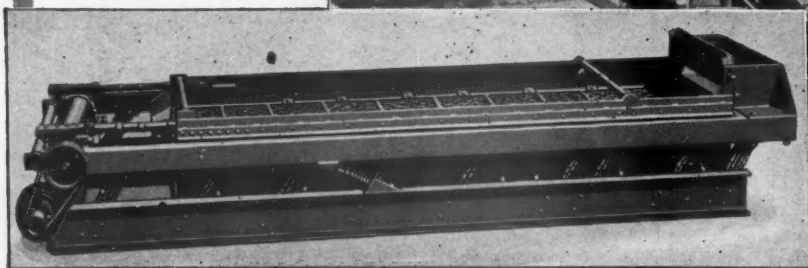
MACWHYTE COMPANY, KENOSHA, WISCONSIN
Manufacturers of a complete line of wire ropes for shovels, drag line excavators, slack line excavators, quarry derricks, digging and bucket hoist lines, clamshell cranes, and special "Hi-Lastic" line for blast-hole drilling.

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CRUSHERS AND SCREENS

for major projects

Two 4 x 10 foot double deck Symons Screens are installed at T. V. A.



This 5½ foot Symons Cone Crusher is doing the fine crushing for T. V. A. at Coal Creek, Tennessee.

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at lower costs. They aid greatly toward more profitable plant operation.

The Symons Crusher is a recognized leader in the reduction crushing field. The flat Symons Screen with its unusual action is destined to the same recognition in the field of screening.

Let us give you further particulars on how you can improve your crushing and screening operations.

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AMAZING NEW TIRE
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Listen to the Voice of Firestone—featuring Margaret Speaks, soprano, and the Firestone Choral Symphony, with William Daly's Orchestra—every Monday night over N. B. C.—WEAF Network

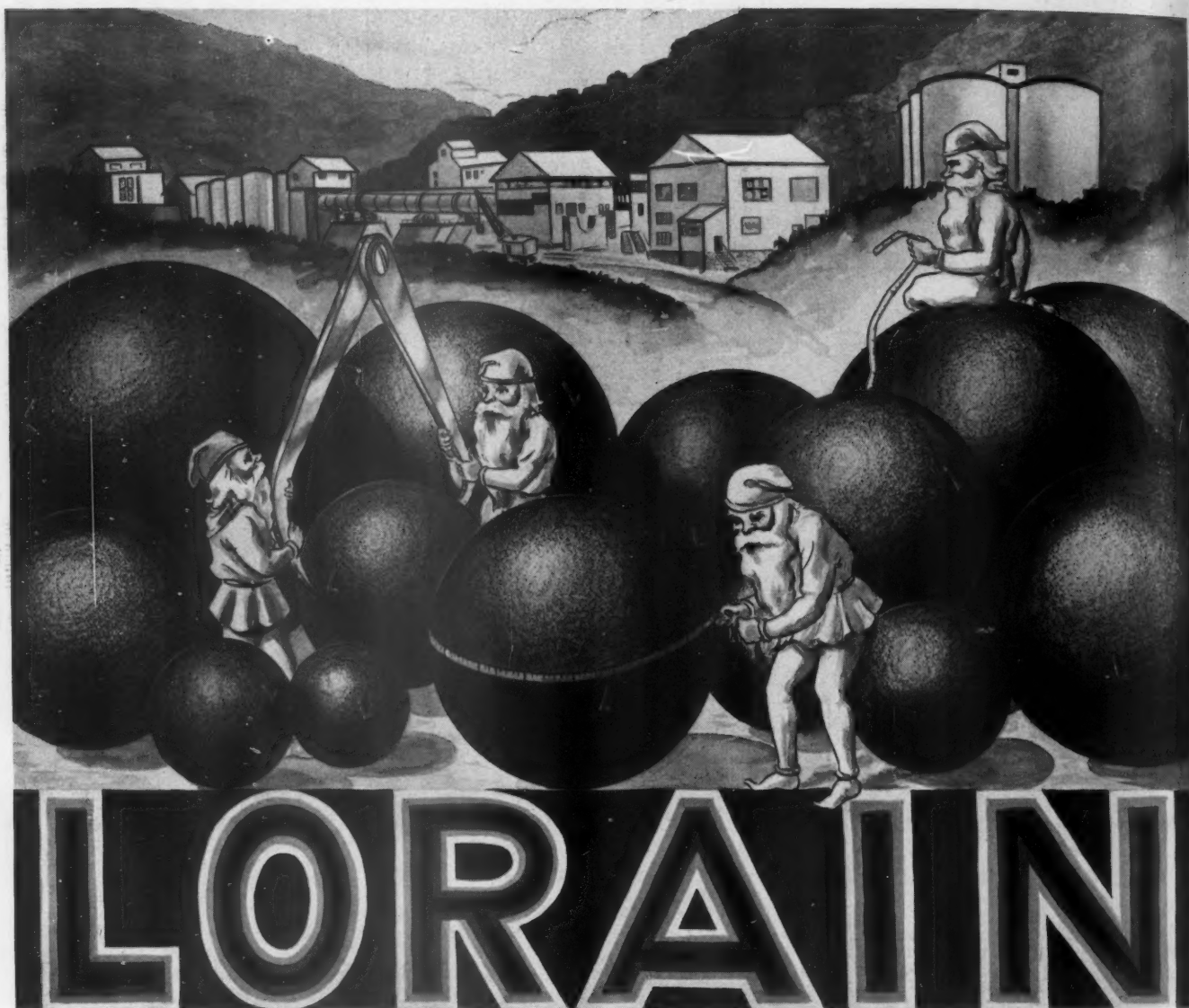


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TRUCK TYPE BATTERIES 	SPARK PLUGS 	BRAKE LINING 
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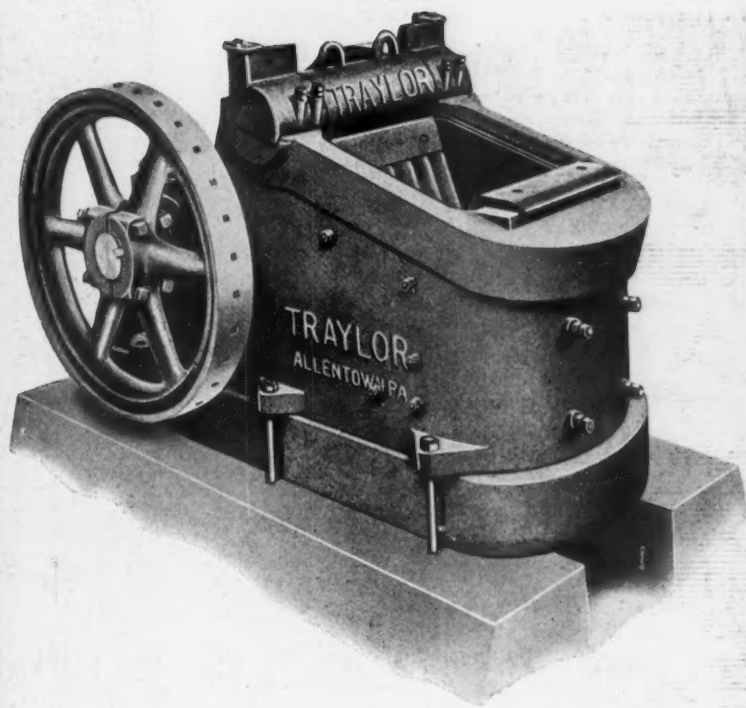
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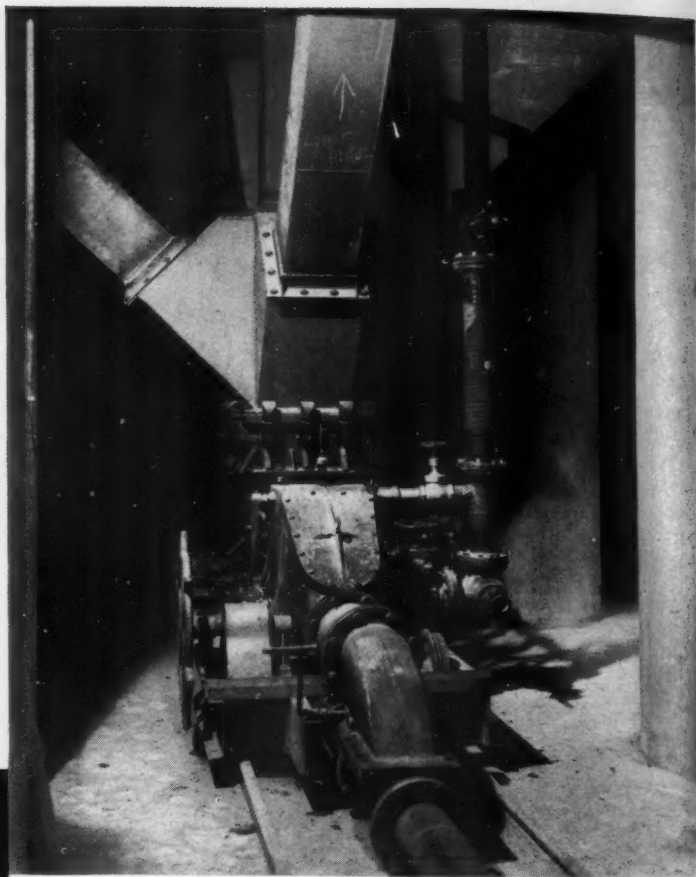
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THREE TYPE H PORTABLE FULLER-KINYON CEMENT PUMPS

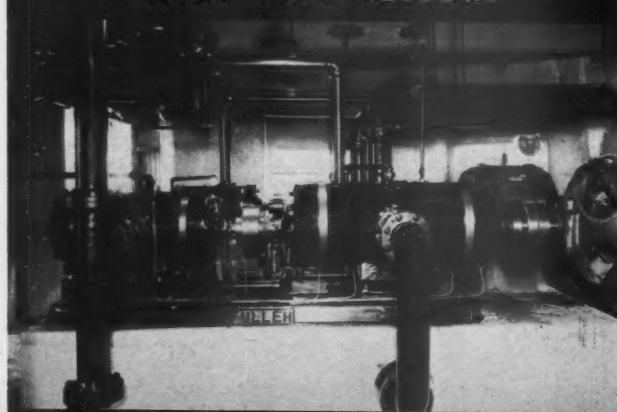
THREE SINGLE-STAGE AND THREE TWO-STAGE FULLER-ROTARY COMPRESSORS



ONE OF PORTABLE
PUMPS BELOW THE SILOS



ONE OF THE SINGLE-
STAGE COMPRESSORS



TWO OF THE TWO-STAGE
ROTARY COMPRESSORS

AT THE NEW PLANT OF NATIONAL PORTLAND CEMENT CO.

cement is withdrawn from silos and conveyed to the packhouse by three Portable Fuller-Kinyon Pumps, travelling on parallel tracks below the bin spouts. This installation brings the number of the new Portable "H" Pumps in actual service up to fourteen. Like the stationary type, these new low pressure, low velocity pumps are showing remarkable power economy.

All of the compressed air for the plant is furnished by Fuller Rotary Compressors. Three single stage machines, one of which is shown at the left, serve the three pumps independently and also furnish air for the packhouse including the packer spill conveyors. Each has an actual free air delivery of 530 CFM at 720 RPM when compressing to 40 pounds gauge. The two-stage machines, shown at the bottom of the page, furnish air for conveying cement from mills to silos and for agitating slurry. Each has an actual free air delivery of 800 CFM at 720 RPM when compressing to 75 pounds gauge. A small two-stage unit serves the quarry with 232 CFM compressed to 100 pounds gauge.

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Built like a Tire



1• The rubber tube is the finest quality oil resistant compound to combat the destructive effect of hot oil in the air line.

2• Each strand of cotton cord ply is laid in a rubber cushion to prevent contact with its neighboring ply. This prevents the rubbing and shearing action between the plies when the hose structure pulsates or expands under pressure—when subjected to constant flexing.

3• It will resist to far greater extent external blows or bruises caused by blasting, dropping tools on the hose or being run over by trucks—this because of its unique carcass structure.

4• It will resist greater pressures than the conventional type, of air hose.

5• It is extremely flexible and consequently much easier to handle in actual service.

6• Its distinctive brown rubber cover will withstand maximum abrasion; will not peel off when cut or gouged, as has been conclusively proven by many tests simulating actual operating conditions.

Here's a new *kind* of air hose—new because it's actually built like a tire to take punishment like a tire! Extensive field tests prove conclusively the outstanding superiority of this hose over the conventional duck or braided ply construction.

Here, in short, is a new product of the world's largest producer of rubber to which we are proud to give our proudest name—U. S. Super Royal Cord. Write today for complete data—address United States Rubber Products, Inc., 1790 Broadway, New York

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WITH
TIMKEN ROCK BITS



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A new Timken Rock Bit Booklet has just come off the press. It tells the whole story of Timken Bit economy. Write for your copy NOW.

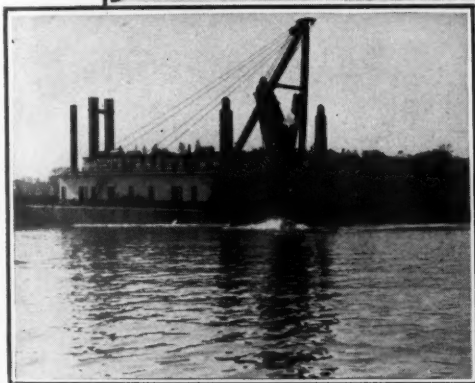
THE TIMKEN ROLLER BEARING
COMPANY, CANTON, OHIO

TIMKEN BITS

BEHEMOTH, TAKE A BOW!

TOLEDO III

Owned by M. A. Breymann. Operates a 17-yard bucket for hard digging—a 28-yard bucket for soft digging. 150 feet in length—58-foot beam—12 feet from deck to bottom. Boom 85 feet long—10-foot boom sheave. Has largest main hoist rope ever built for this type of equipment!



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**LARGEST DIPPER DREDGE
IN THE WORLD CHOOSES**

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*Digging
Strength*



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at the digging end

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Strength—from the full anti-friction bearing shipper shaft to the easy-filling full capacity all-manganese dipper.

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FRAGMENTATION**

LITTLE PIECES CAN MEAN . .

More Profit

THERE should be more profit for you when your shovels can keep on scooping up the little fellows, instead of trying to cope with big rocks. That is what we mean when we say that "Little Pieces can mean *more profit*."

With Cordeau-Bickford Detonating Fuse, you can get little pieces—real pay dirt—from each charge. Each cartridge is, in effect, a primer cartridge because the line of Cordeau extends from the top to the bottom of the charge—detonates all cartridges completely and practically simultaneously.

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Increase your profits by getting more pay dirt. Cordeau will do it for you and pays well in four other ways, too! . . . Write us for full information. THE ENSIGN-BICKFORD COMPANY, Simsbury, Conn., Established 1836.



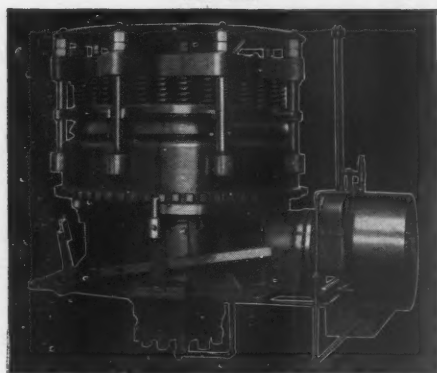
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THE ENSIGN-BICKFORD COMPANY

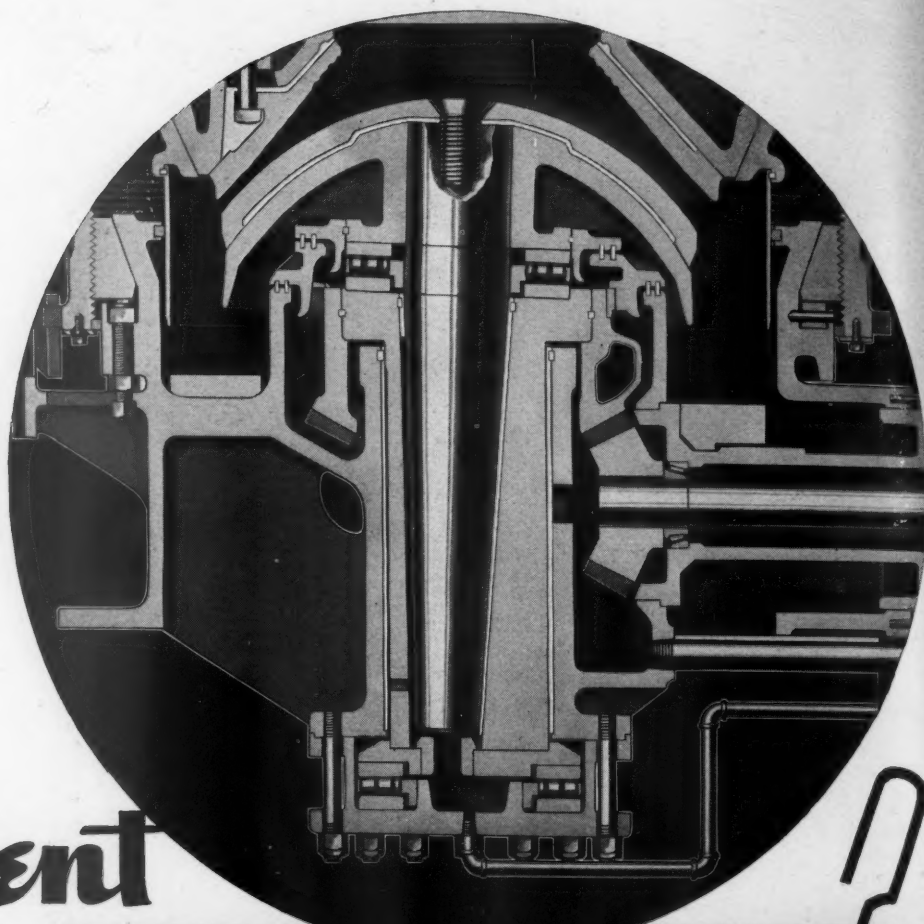
CB-44

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Different
ABOUT THE



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SMITH
ENGINEERING WORKS
508 E. CAPITOL DRIVE
MILWAUKEE, WIS.



TEL SMITH
GYRASPHERE

The spherical head and corresponding concave (shown above) are adapted from the first crusher devised by primitive man—the mortar and pestle. The parts are inverted to facilitate discharge; but the crushing action is the same. Particles are caught and broken between two multi curved surfaces, causing an ideal cubing action. The same mechanism that ground corn meal in ancient Egypt now produces an improved cubical aggregate in modern mines and quarries. *Write for Bulletin Y-11.*

TEL SMITH

Y-2

LIMA Type 801

ALL-WELDED OUTSIDE TYPE DIPPER HANDLE

The dipper handle is made in two sections. Each section is composed of two heavy angles electrically welded at the opposite corners with I Beam insert, to form a solid box design of unusual strength. The racking is made in convenient length sections.

ELECTRICALLY WELDED BOX TYPE BOOM

The boom is a self-contained, electrically welded structure. No bolts or rivets are used in its construction. The large diameter boom point sheaves permit greater cable economy.

ONE-PIECE MANGANESE DIPPER WITH DETACHABLE LIP

The dipper is one-piece manganese steel with detachable lip. The sheave through which the two-part line passes forms part of the dipper bail, thus permitting maximum digging and dumping heights.

Carefully designed and built from the ground up, a heavy-duty two yard machine, the LIMA Type 801 is meeting the requirements of users whose work demands full two yard capacity from engine to dipper teeth.

The all steel, electrically welded boom with wide flaring base, and the wide-spread dipper handle which holds the dipper squarely against the work is the last word in shovel front ends. Modern heavy-duty construction plus the many advanced and profitable mechanical features offered only by LIMA, is the reason why production records go up and stay up whenever LIMAS are used.

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LIMA, OHIO, U. S. A.

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1670 St. and Sedgwick
Avenue

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Bldg.

NEWARK, N. J.
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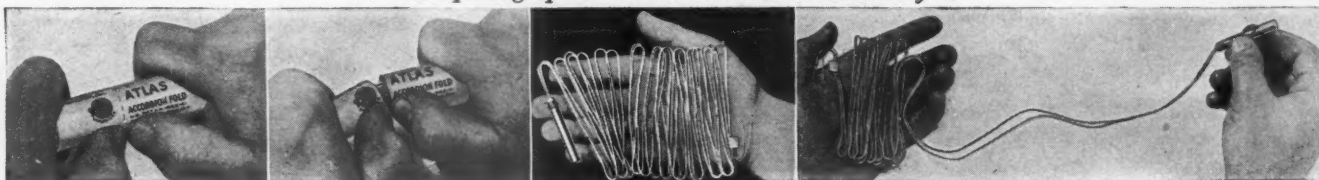
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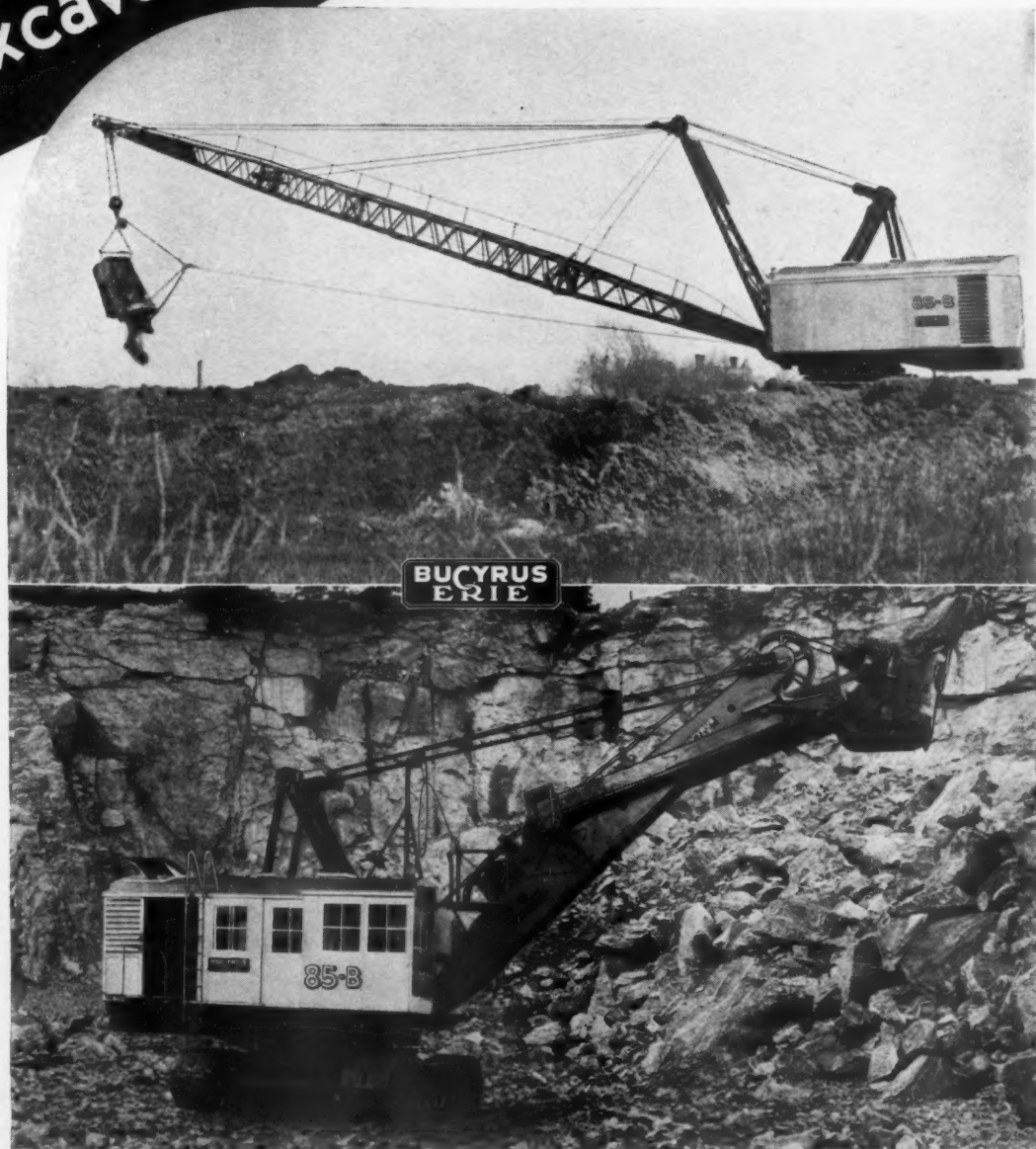
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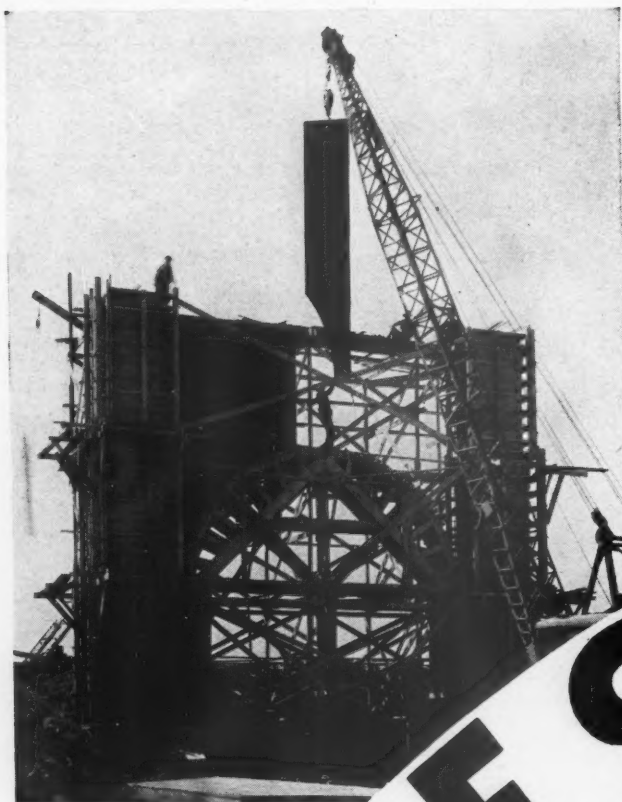
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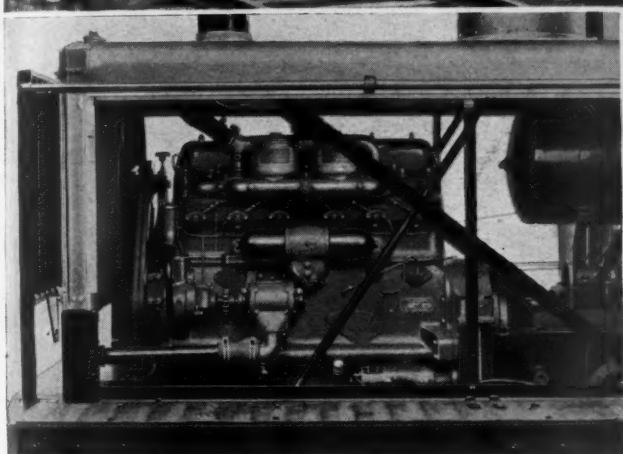


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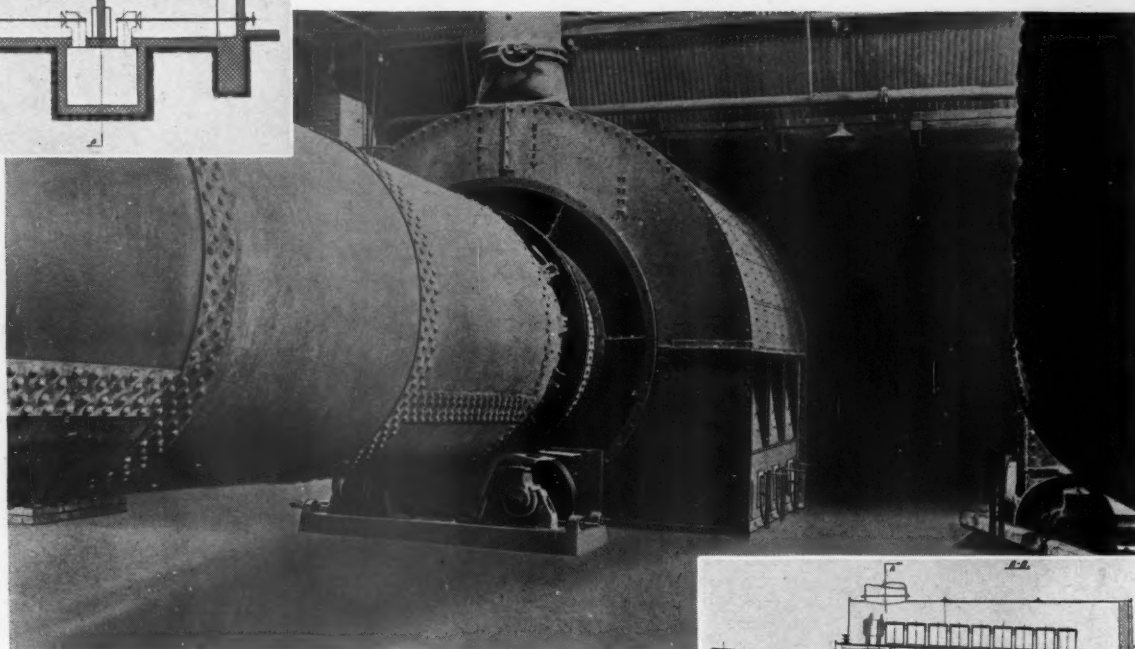
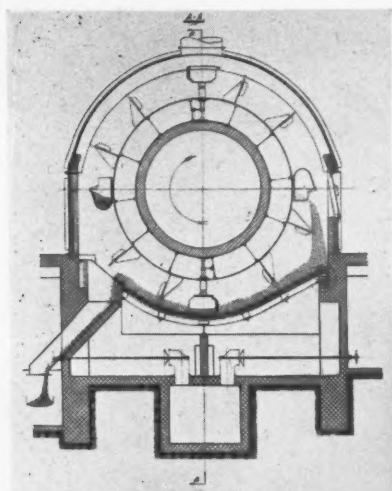
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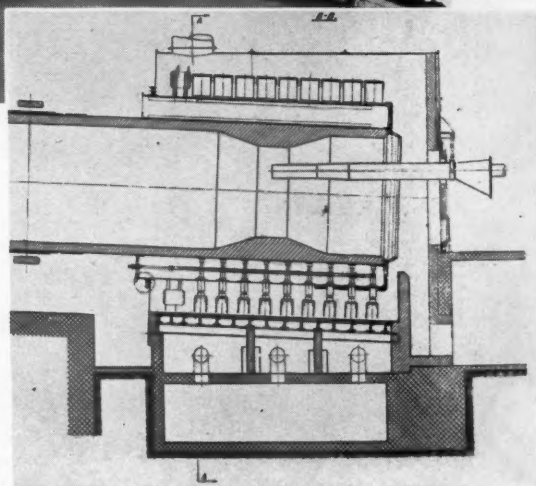
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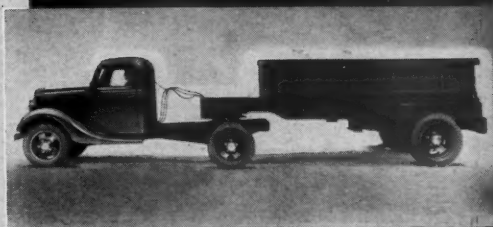
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● The Trail Car cuts hauling costs by increasing the pay load, thus reducing the number of hauling units required on the job. It takes double the load that a conventional truck can carry on its own chassis, yet its dimensions and maximum load conform to every state limitation of semi-trailers.

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Above illustration shows the Trail Car servicing an Austin-Western Elevating Grader.

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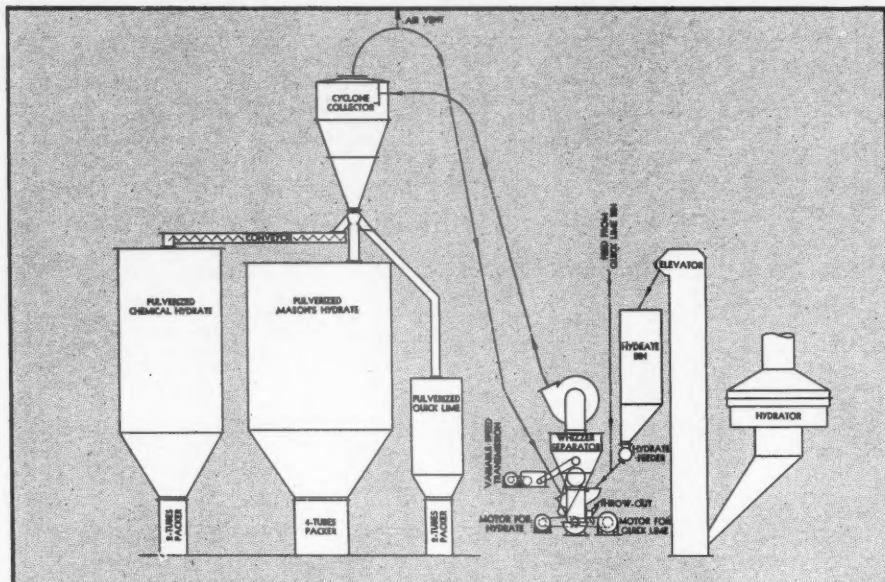
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Double Duty Pulverizer for Lime Plants

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This combination unit is specially adapted for separating hydrated lime and quick lime, one machine serving for both operations. The degree of fineness depends on the speed of the revolving whizzer blades, so that the use of a variable speed transmission on the whizzer drive permits easy regulation of the material from coarse to fine, simply by shifting the speed control lever.

One of the recent installations in a lime products plant consists of a No. 1 Automatic Pulverizer, equipped with throw-out device, lump feeder and whizzer with variable speed control, arranged as shown above with feed supply, cyclone collector and finish bins for separate products.

When set for producing hydrated lime at 80% to 99% passing 300-mesh, the mill delivers 4 or 5 tons per hour for the coarse to 3 tons for the fine. When operated at high speed for making burnt lime, at 95% to 98% minus 200-mesh, the mill produces 3½ or 4 tons per hour for the coarse to 2 or 2½ tons for the fine stuff.

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That's the Keynote in P&H Ward Leonard Design

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From crawlers to boom tip P&H Ward Leonard machines are designed to eliminate all possible physical effort in the interest of faster operating speeds.

Electrically controlled throughout, all equipment is conservatively rated and so installed as to give the machines an unusually simplified appearance. One of the first things that will strike you as being new and different about these models is the careful spacing of all machinery units on the main working frame to provide a distribution of weight back of the center of rotation. Less counterweight to move means less waste of power, lower operating costs and faster action.

Higher Speed Swing Gears

The swing units (dual type on the 1400) are built on the modern gear reduction principle with helical high speed gears operating in parallel, each sharing half of the torque required to rotate the machine. Actual swing speed attains a maximum of $3\frac{1}{2}$ RPM. No beveled gears are used in this reduction. All gears are mounted on anti-friction bearings constantly sprayed with oil by a separate high pressure pump.

The crowd mechanism, fully enclosed and oil lubricated, represents a modern departure from conventional design. The axis of the crowd motor is parallel with the axis of the boom and is mounted down near the foot. The six foot boom sheaves operate on huge Timken bearings capable of carrying twice the load imposed upon them.

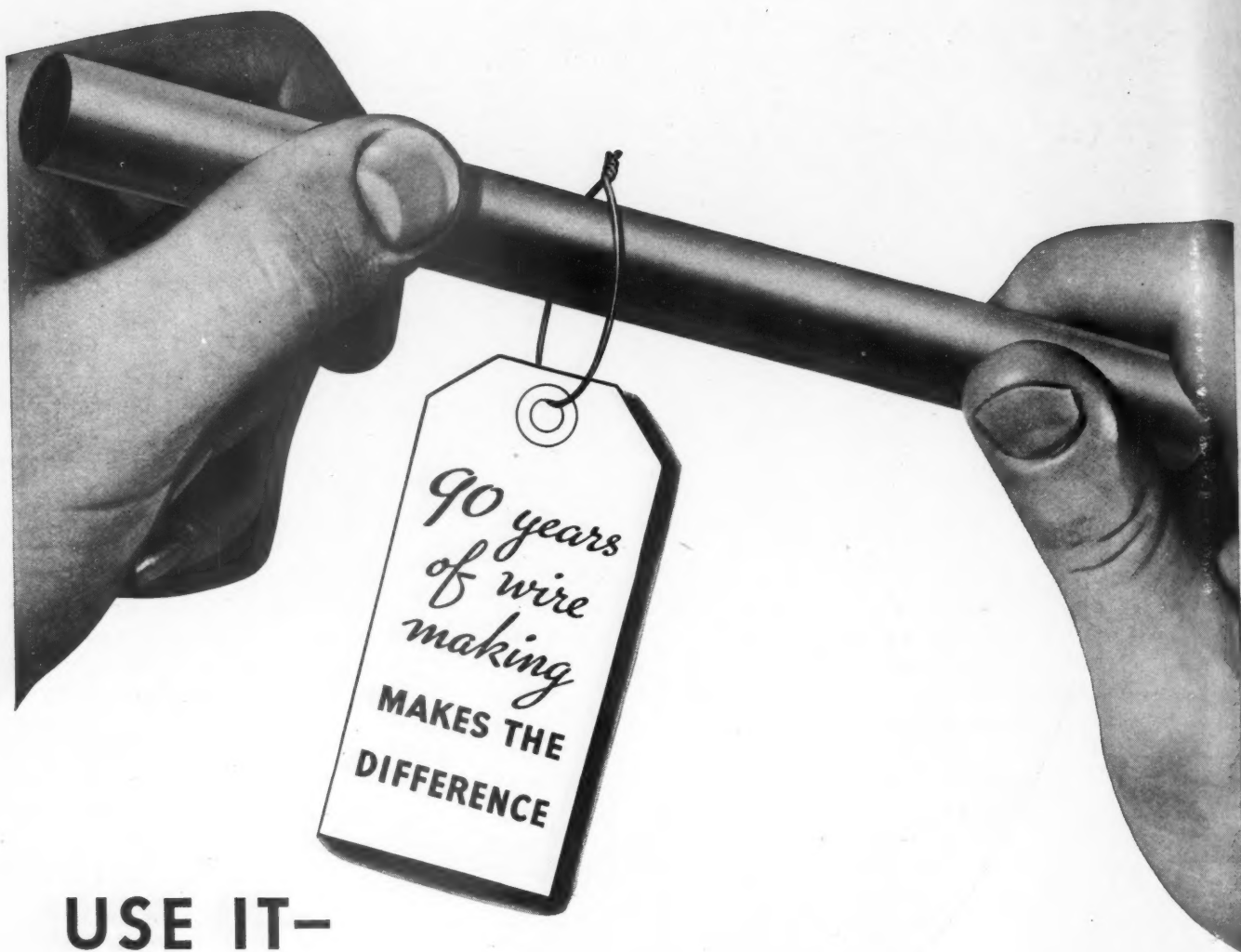
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Steering is accomplished through the use of clutches, operated by hydraulic cylinders, and electrically controlled from the driver's seat. Brakes and clutches are also hydraulically controlled, eliminating hand levers and pedals, reach rods, bell cranks, etc.

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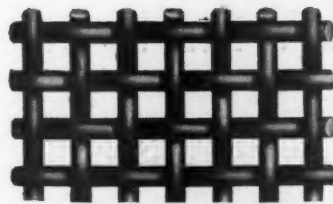
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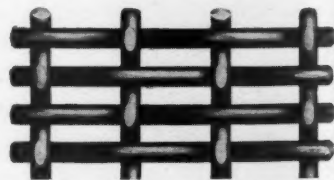
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Rock Products

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Volume XXXVIII

Chicago, July, 1935

Number 8

Recovery Progress—Trends—Editorial Comment

PUBLICATION OF THIS ISSUE of ROCK PRODUCTS was delayed in order to give readers a report of the result of a joint meeting of the boards of directors of the National Crushed Stone Association, the National Sand and Gravel Association and the National Slag Association—the three national organizations representing mineral aggregate producers. It was believed that the outcome of this meeting would have an important bearing on the future of these industries—or better, of *this industry*.

For ROCK PRODUCTS assumed a Federal Government impatient of limitations on its control of industry, a government constantly engaged in encouraging public competition with private industry—particularly in the mineral aggregate industry—a government which directly or indirectly is about the only present buyer of the products of this industry.

The Federal Government is organized today, as never before, to follow the direction of a single leader. Labor is organized, as never before, with the assistance and influence of the Federal Government. Only industry management lacks effective organization, or in other words, effective leadership.

Of course, men who have won success in life, or business prestige, by being individualists, leaders in their own lines, by having more initiative than their fellow citizens, are not so easily organized, so easily led as a herd, as either politicians or labor. But it would seem that a time has come for national leadership of industry, and failure to realize this universally may prove costly to industry.

In the case of the mineral aggregate industry some tangible good was accomplished under its NIRA Code chiefly because local groups of producers were able to work together harmoniously and effectively. The national Code Authority served a use-

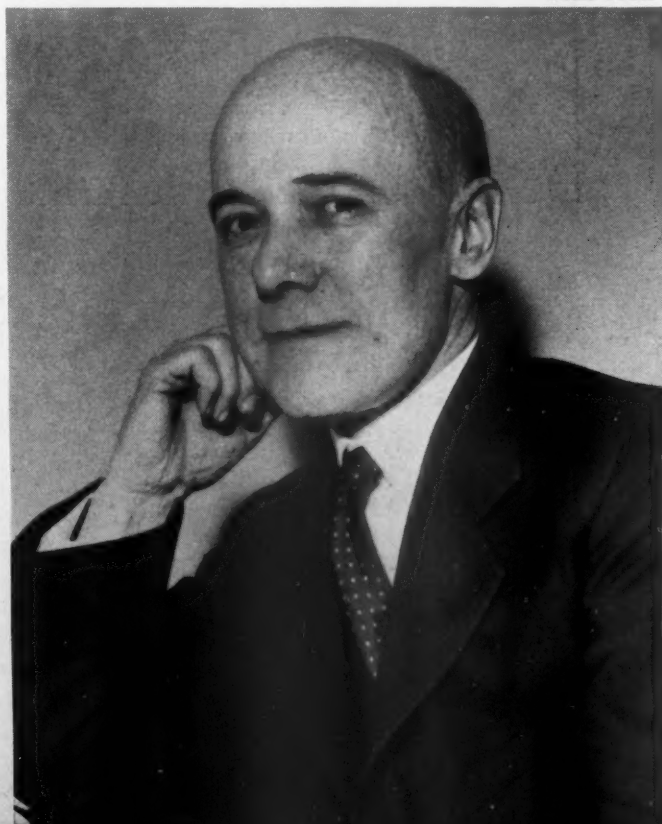
ful purpose in coordinating these local efforts, in keeping the industry posted on national developments, and most of all, in pleading the case of this industry, and in some degree of *all industry*, before the powers of government at Washington. This last service is probably the least known and certainly the least appreciated of the very great services rendered the industry by its Code Authority.

Apparently the thought of the industry, if truly reflected by the boards of directors of the three national associations, is that local cooperation for the same purposes as under the code will continue without much of any kind of a unified national organization at Washington—at least temporarily—if it is to continue at all. The nucleus of the same organization of the three industries that functioned under their common code will be preserved, pending developments.

Of course, there will always be a difference of opinion as to whether or not this was the time to meet the issue and plunge into the national arena with a strong unified group, or to await developments which may or may not later force such an organization. A forceful minority group in the three associations believed this was the time.

A banker heads what is left of NRA—James L. O'Neill

Acme Photo



ROCK PRODUCTS believes this minority was right because it believes that only effective organization of business and industry can counteract the present organization of politicians and labor, which apparently aims to curb all industrial and business initiative. By effective organization is meant organization for some one or more common objectives, even if that objective is merely the preservation of the right of industry to try to make a profit; or the prevention of government experiments in business and industry with the public's money by men wholly unequipped by ex-

perience or mentality to engage in business and industry.

Naturally, then, it is a little discouraging to those of us who would like to see all industry efforts organized and coördinated for a common objective, to see, instead, three groups of producers of mineral aggregates whose problems appear to be mainly common problems, insist that their individualism be preserved at all costs.

Construction Industry Must Fight for Existence

The conditions promulgated by the President and Mr. Hopkins for spending the \$4,000,000,000 for relief and public works have practically ruled out public works. Even Gen. Hugh S. Johnson, appointed Mr. Hopkins' representative for spending in New York City, says the conditions laid down render the spending useless—that when the money is gone we shall be just where we started from.

On this point, at least, the mineral aggregate industries' representatives were unanimous, and the resolution adopted by them in Chicago, June 29, is given prominence elsewhere in this issue. There is another angle of approach, and one that the President undoubtedly has in mind, and in our resentment should not be wholly overlooked. That is his desire to compel the local governments to assume a larger share of the cost of these local public works. If, for example, it requires an expenditure of \$4,000 per man actually employed on the job to lay a modern highway pavement, and the President's rules require the Federal contribution to be so spent that \$1,400 of it goes for wages per man employed on the job, it is obvious that \$2,600 per man must be provided from other sources to pay for materials, etc. If the various states had not diverted their gasoline and automobile license taxes they would be able to obtain this \$1,400 as an outright gift from the Federal

Government for every \$2,600 of their own highway funds. (This in addition, of course, to their regular federal aid funds, which are not affected by the President's rules.) A few years ago the states would have considered this generous, and every one would have striven to take advantage of the offer. Now, the states look to the Federal Government for all as an outright gift.

So, while there should be every effort made to get Congress to see the futility of expending \$4,000,000,000 under such conditions as the President and Mr. Hopkins have outlined, we should, as citizens of our local commonwealths and cities, strive to get their finances reorganized so that they can continue to exist and perform their normal share of public works when the Federal Government lets them down, as it must eventually, if it is to preserve its own solvency. Both local and national leadership have their places, and an industry needs one as much as the other.

Leadership Never More Needed

Such business leadership will recognize that we are passing through a bloodless revolution, that the ultimate good health, well-being, and solvency of our country are a whole lot more important than the preservation of present competitive relationships in business and industry.

Real business leadership will make business and industry a partner and mentor of its labor, instead of leaving labor's guidance or rather misguidance to politicians. That does not mean paternalism in industry. It means that management and labor have a common objective which is a healthful nation—preserving opportunity for all who work and have intelligence. Self-respecting labor is no more anxious to be on a government dole than is management anxious to turn industry over to muddling politicians.

Cement

Missouri Portland Cement Co., St. Louis, Mo.: G. M. Block, formerly vice-president, was elected first vice-president and general counsel by the board of directors at its initial session following the annual stockholders' meeting, and C. A. Homer, formerly vice-president, was made second vice-president. M. Moss Alexander, president, and all other officers were re-elected. Stockholders elected Jacob Weisheyer, secretary, a member of the board, filling the vacancy. All other directors were re-elected.

◆ ◆ ◆

Sand and Gravel

Chillicothe Gravel Co., East Peoria, Ill., will open a new pit on a 22½-acre tract near the junction of the Santa Fe and Rock Island railroads at Chillicothe, Ill., according to Thomas W. Gibbons, Peoria, one of the incorporators of the new company. The other incorporators are his father and mother, Mr. and Mrs. John Gibbons, East Peoria, and his brother-in-law, Jacob H. Irions, East Peoria. They also operate the East Peoria Sand and Gravel Co., East Peoria. The firms will operate as separate companies, he stated.

Erection of equipment at the Chillicothe site is now in progress. Capacity of the plant, which is expected to be in operation in the middle of July or shortly afterward, is estimated at 500 tons daily. Increase in business at the East Peoria plant, which has only outlet by truck, necessitated the expansion, with formation of the new company for operation of the pit at Chillicothe, where shipment may be made by rail, Mr. Gibbons said. The new company, with headquarters at East Lane, East Peoria, was authorized to issue 500 shares of no par value common stock to manufacture, refine and sell silex, sand, gravel, and other products.

◆ ◆ ◆

Florida Gravel Co., Chattahoochee, Fla., has recently built a new dredge, with an 8-in. Morris pump, powered by a 120-hp. Cooper-Bessemer Diesel engine. Screening is done on the dredge with a triple-deck 4 x 8-ft. Niagara vibrating screen, the different sizes being chuted to separate barges alongside. The dredge is operating 30 miles upstream from Chattahoochee on the Apalachicola river. Three barges and the stern wheeler "Callahan" have been added to the fleet recently.

Pacific Coast Aggregates, Inc., San Francisco, Calif., which was recently reorganized under the national bankruptcy law, has elected the following officers and directors: C. M. Cadman, president and general manager; E. B. Kendall, Donald Meek and R. C. Ford, vice-presidents; H. W. Senter, secretary and treasurer. Directors: C. M. Cadman, R. C. Ford, G. C. Jamieson, N. B. Livermore, Louis Sutter, E. C. Sterling and S. H. Palmer. Directorate has been reduced from 17 to 7 members.

◆ ◆ ◆

Gypsum

Ceramic Association of New York includes gypsum in its definition of ceramic industry. At a recent meeting, F. M. Thorman, quality supervisor, U. S. Gypsum Co., Oakfield, N. Y., read a paper on "Quality Control." The association was formed about a year and a half ago and Mr. Thorman is a director representing the cement, lime and gypsum industries. Dr. M. E. Holmes, at one time in charge of research for the National Lime Association, is secretary-treasurer (he is now dean of the New York State College of Ceramics, Alfred, N. Y.).

Rock Products News Briefs

Status of Work Relief to July 8

UP to July 8 the President had allotted \$1,260,194,074 of the \$4,000,000,000 employment fund to finance work for 738,402 needy in three months the program has been in effect, according to the *Chicago Journal of Commerce*.

He has a balance of \$2,739,805,926. He must use it to make jobs for 2,761,598 more persons if the administration is to end the dole by July 1, 1936, by transferring 3,500,000 men and women from doles to federal pay-rolls.

The 738,402 jobs accounted for still are listed only on paper. Congress made the \$4,000,000,000 available on April 8. So far only four employment projects are under way.

The 738,402 jobs provided for by definite allocations averaged \$1,706.51 per man, including wages for one year, cost of project materials, overhead and contractors' profits.

The administration must figure \$1,143 per person employed if it is to achieve the 3,500,000 at work goal. Mr. Roosevelt must allocate the \$2,739,805,926 balance at the rate of \$992.10 apiece for the remaining 2,761,598 needy to do this.

An official survey of the Presidential allotments, per man employment costs on each grant and the estimated number of persons who will be put to work, revealed:

	Cost per man	Persons to be employed
CCC	\$316,658 000	\$1,200 263,880
Highways	300,446,500	1,400 214,318
Grade-crossing elimination	200,000,000	2,250 80,000
Rivers, harbor improvements	107,986,500	2,200 50,000
Rural resettlement	107,000 000	..... none
Low-cost housing	69,985,000	2,500 27,994
Reclamation	58,060,000	2,500 23,224
Soil conservation	25,000,000	1,200 20,833
Public works construction	22,762,828	959 23,736
Navy (yards, docks repair)	15,684,160	1,100 14,258
Agriculture (forests, plants)	15,237,500	1,000 15,237
Program administrative exp.	12,336,655	..... none
War (forts, cemetery repair)	5,610,931	1,140 4,922
Indian bureau	2,526,000	..... none
National resources commission	900,000	..... none
Totals	\$1,260,194,074	\$1,706* 738,402

*Average.

To Lump Allocations

Mr. Roosevelt and Harry L. Hopkins, works progress administrator, are preparing lump allocations for distribution by August 1 to every state to finance cheap, local projects at an average of \$992.10 per job.

They must put the bulk of needy to work at less than \$992.10. A portion of the money unobligated is to go for low-cost housing, civilian conservation corps, reclamation and other activities well above that figure.

They started this phase of the program by distributing \$138,122,275 to five political subdivisions to launch work-progress projects to employ 169,900 persons at \$812 apiece. A summary of the allotments:

State.	Allotment	Persons to be employed
Alabama	\$ 10,196,346	*12,357
Georgia	10,256,600	12,631
New York City	78,657,310	96,869
Indiana	37,052,978	45,631
Washington, D. C.	1,959,048	2,412
Totals	\$138,122,275	169,900

*Estimated.

Congress appropriated \$880,000,000 for direct relief along with the \$4,000,000,000 employment money. The sum was for the federal emergency relief administration to spend feeding and clothing the nation's needy until the works drive becomes effective.

Mr. Roosevelt has given FERA \$545,000,000 of the \$880,000,000, leaving only \$245,000,000. The fund, at the present rate of expenditure, will last only through August, September and October. Both the President and Mr. Hopkins predicted the job campaign will not reach its full peak until mid-November.

Bentonite

Upton, Wyo.: An increased demand has necessitated capacity production at bentonite plants in northeastern Wyoming. For the past three months, the plants have been running full speed in an endeavor to keep orders filled. The products are being shipped to many points in the United States and to Canada and Europe, where they are used for manufacturing purposes. The Jerome plant, under management of Frank Mendenhall, heads the list with the largest output of this product, with the American Colloid running second and Clay Spur, third. From February 1 to May 21 the Jerome plant shipped 134 cars; the American Colloid, 106 cars; Clay Spur 94 cars; Newcastle, 6 cars, and Upton, 4 cars. All plants' total has been averaging around 105 cars per month, and, since February, 1344 cars have been billed out of Upton. Some of the shipping points are listed as follows: Muskegon Heights, Mich.; Chicago, Ill.; Brooklyn, N. Y.; Detroit, Ill.; Mobile, Ala.; Houston, Tex.; Paris, France; Omaha, Neb.; Charles City, Ia.; Denver, Colo.; Lincoln, Neb.; Sarnia, Ontario, Canada; North Flint, Mich.; Moline, Ill.; Racine, Wis., and Cleveland, O.

Mica

Southern Mica Co. will abandon its mica mine and grinding plant near Franklin, N. C., and establish a new plant at Johnson City, Tenn. D. D. Rice is president and general manager. The company specializes in dry ground mica, used in various wall and roof surfacing preparations, in the manufacture of rubber, insulation materials, and a number of other industrial products.

Portland Cement Pavement Yardage

AWARDS of concrete pavement for May, 1935, were announced by the Portland Cement Association as follows:

	Sq.yd. awarded during May, 1935	Total sq.yd. for year to date, June 1, 1935
Roads	1,111,150	7,954,150
Streets	1,124,540	4,098,745
Alleys	14,154	45,885
	2,249,844	12,098,780

Sand-Lime Brick Production and Shipments in May, 1935

THE FOLLOWING DATA are compiled from reports received direct from producers of sand-lime brick located in various parts of the United States and Canada. The accompanying statistics may be regarded as representative of the industry.

Eight active sand-lime brick plants reported for the month of May, this number being two more than the number reporting for the month of April, statistics for which were published in June.

Average Prices for May

Shipping Point	Plant price	Delivered
Grand Rapids, Mich. ....	.....	\$13.00
Detroit, Mich. ....	.....	11.50
Mishawaka, Ind.	\$9.25	.....
Syracuse, N. Y.	14.00-20.00	16.00-20.00
Saginaw, Mich.	10.50	.....
Sioux Falls, S. D.	11.50	.....
Toronto, Ont., Can.	12.00	13.50

Statistics for April and May

	April*	May*
Production	345,360	1,821,120
Shipments (rail)	104,000	125,000
Shipments (truck)	342,562	1,753,661
Stocks on hand	345,774	1,374,199
Unfilled orders	850,000	810,000

*Six plants reporting; incomplete, three not reporting unfilled orders.
*Eight plants reporting; incomplete, three not reporting unfilled orders. The figure showing unfilled orders includes 400,000 brick for PWA.

Cement Products

Cement-Asphalt Products Co., Winfield, Kan., has been purchased by Charles Watson and M. P. Murphy and operation resumed. Output includes individual mausoleums and various types of cement and asphalt products.

E. H. Ehlert Concrete Products Co., Cleveland, Ohio, lost a \$15,000 damage suit in a jury trial to an 11-year-old boy, who was injured seriously while playing with a blasting cap. The boy is alleged to have found the cap in the company's shed, and the court decided the company was negligent in not keeping the caps where the boy could not have obtained one.

Spencer Cement Block Works, Spencer, Ia., A. P. Nelson, proprietor, is building an exhibition "house of tomorrow," in which many varieties of concrete products, including joints and floor slabs, are used.

Lime Industry Will Attempt to Carry On Under Voluntary Code

Possibilities Under Present Laws Will Be Thoroughly Explored

THE LIME INDUSTRY of the United States was rather inadequately represented in both numbers and tonnage at the annual convention of the industry and of the National Lime Association at Hot Springs, Va., June 19 and 20; but this was because of a general feeling that things would go along as they have rather than to a lack of interest or apathy. The annual convention was preceded by meetings of the former Code Authority and of the board of directors of the National Lime Association. The Code Authority wound up its affairs by officially disbanding and providing for the distribution *pro rata* of a surplus of \$14,000. The directors of the association voted to continue so far as possible to hold the good the industry had derived from its NIRA code.

Declaration of Policy

The thoughts of these leaders of the lime industry are crystallized in the following resolution, adopted by them and concurred in by the convention:

1. That it is the sense of this Board that immediate steps be taken by the Lime Industry to preserve and perpetuate by every means available and as far as possible the benefits which have accrued to the industry and all engaged therein from the Code of Fair Competition of the Lime Industry.

2. That as a first essential step the said Board recommends that the Lime Industry as a whole, meeting at this place on June 19, 1935, authorize and empower the Trade Relations Committee of the National Lime Association, and any subcommittee thereof, to investigate, consider and develop practical ways and means to preserve and perpetuate the benefits of the Code, and to submit to the industry at the earliest practicable date for its voluntary acceptance or rejection a plan in concrete form for achieving this end.

3. That the plan to be developed and reported to the Lime Industry, whether by way of industry agreement to be submitted to the President pursuant to Section 4(a) of Title I of the National Industrial Recovery Act, or otherwise, shall, so far as practically and legally possible, contain the following:

(A) Such definitions from the Lime Code as are found to be appropriate.

(B) Provision whereby labor standards can be maintained through the continuance of the minimum wage scales now in effect and such other related provisions with respect to labor as conform to governmental requirements.

(C) Provision for the filing with an appropriate agency or agencies of complete price lists individually arrived at, including terms and conditions of sale, together with provision for making such price lists available to members of the industry and to the trade.

(D) As many of the Trade Practice Rules contained in Article IX of the Lime Code as the industry at its meeting on June 19, 1935, shall indicate that it desires and as are found by the Trade Relations Committee to

be legal and acceptable to the appropriate governmental agencies.

(E) If legally feasible a plan for the voluntary enforcement of the open price and trade practice rules under which members of the industry will agree to pay to the industry as a whole liquidated damages for the infraction of said rules, together with provision for determining whether or not said rules have been violated by means of arbitration or other procedure within the industry.

(F) A fair equitable plan for participation in the costs of developing and administering such plan by all members of the industry on a voluntary basis, the arrangement to provide for binding agreements between those wishing to participate and those incurring obligations in reliance upon such participation.

(G) Such other beneficial or remedial provisions as may be suggested to or developed by the Trade Relations Committee in its work in behalf of the industry.

4. That pending the submission and adoption or rejection of a plan as herein suggested, the Board of Directors strongly urges upon the industry that the Code standards with respect to labor, and publication of prices, and adherence to trade practice rules, be continued upon an individual and voluntary basis until such time as the Trade Relations Committee can complete its inquiries and submit to the industry a plan for perpetuating the benefits of the Code upon a basis of effective coöperation.

Specimen of Industry Agreement

The board of directors of the National Lime Association and its counsel, Abram F. Myers, submitted to the convention a specimen form of industry agreement, which is essentially a new code containing all such provisions as are deemed legal and binding, under their present understanding of the law of the land. This new code and agreement would continue until April 1, 1936, which is the expiration date of the National Recovery Act as amended and extended by recent congressional and executive action. Acceptance of this agreement must come, of course, from that large part of the lime industry which was not represented at the Hot Springs convention in order to be effective; but if the thought and action of the convention are indicative of the industry as a whole, there will be little disturbance to the relative stability the industry has achieved the last two or three years.

The proposed voluntary agreement naturally carries no provision for enforcement, although a liquidated damage clause is included as optional, for those who want to enter into such further agreement. Any member may withdraw on 15 days' advance notice, and 75% of those agreeing may amend the agreement at any time. While unanimously adopted by the convention in substance, the form of the agreement is subject to such changes as circumstances and negotiations

with the government may require. In the meantime the National Lime Association was voted authority and funds to carry on. Lime manufacturers have acted and will act on the proposed agreement through district meetings.

Price Quotations

Of course the parts of all industry codes that producers and manufacturers are most doubtful of under the new conditions are those relating to the open-price policy, or price posting. Therefore, this part of the new proposed lime industry agreement is of general interest. It reads as follows:

1. **Publication of Prices.** Each member shall, within 10 days after subscribing and assenting to this paragraph, publish to the trade and simultaneously, or prior thereto, file with a confidential and disinterested agency of the district committee for the district in which the manufacturing plant is located, or if no such district committee then with a confidential and disinterested agency appointed by the Trade Relations Committee of the National Lime Association. Complete price lists which shall include in all cases discounts, terms, trade classifications sold, duration of bids and contracts and defining the same and all other conditions of sale of all industry products manufactured and/or offered for sale by such member from such plant and shall simultaneously publish to the trade concerned and file with the same confidential and disinterested agency all subsequent changes therein. All such price lists or changes therein to become effective upon receipt thereof by the confidential and disinterested agency.

When any such price lists or changes therein have been so filed the said agency shall immediately communicate the same to each member of the district, in which the plant is located and to any members whose plants are in other districts and who have in writing requested copies thereof and to all customers and to such of the trade as apply therefor in writing and agree to defray the costs of the preparation and distribution thereof.

3. **Sales at Published Prices.** No member shall sell or offer to sell any industry product at a price or prices below or upon terms and conditions more favorable to the buyer than those stated in such members' price lists then in effect; except

(a) To meet competition of products of similar grade and quality and in such case the member shall, within 24 hours thereafter, file with the disinterested and confidential agency of the district in which the plant of shipment is located, the price at which, and the terms and conditions of sale upon which, such sale was made and a notation of the name of the competitor, customer and price and terms and conditions of sale which it was necessary to meet; and

(b) On orders to fill specific or period requirement contracts or contracts for specified amounts which have been entered into at the members' current published price on the date of the contract or entered into within 30 days after a change in published price

based on a quotation made before such change at the members' then current published price and which have been listed with the confidential and disinterested agency if so requested by him as hereinafter provided.

Finances

The board of directors of the National Lime Association is modest in its estimate of the cost of carrying out the program, which it is hoped will win the unanimous support of the entire industry. The following resolution expresses the board's bid for such voluntary financial support:

WHEREAS, many members of the Lime Industry have expressed a keen desire to hold and consolidate the gains resulting from the operation of the Lime Code, and have expressed their intention to comply voluntarily with the provisions of said Code until such time as a voluntary agreement plan is adopted by the industry, and

WHEREAS, these members recognize that the cost of continuing the administration of the Code provisions on a voluntary basis, of preparing and negotiating a suitable agreement with the properly authorized governmental agency or agencies and of the administration thereof, will fall upon the National Lime Association, and

WHEREAS, these members of the industry realize that the National Lime Association is without funds to carry on these activities and that, therefore, voluntary contributions must be made, be it

RESOLVED, that this Convention of the industry record its approval of a voluntary assessment upon all members of the industry to defray the costs assumed by the National Lime Association in carrying out the foregoing activities, such individual voluntary assessment to be at the monthly rate of one-tenth cent per ton on the tonnage of quicklime and hydrated lime manufactured and sold by said member during the calendar year of 1934, payable monthly in advance beginning July 1, 1935.

This 1/10c per ton is exclusive of association activities, which its members will support by dues of 5c per ton.

Officers Reelected

S. W. Stauffer was reelected chairman of the board; and the executive committee consisting of Mr. Stauffer with Bernard L. McNulty, George J. Whelan, J. M. Gager and Reed C. Bye is same as the committee which represented the association on the Code Authority.

President Norman Hough Reviews Progress

A few extracts from the address of Norman G. Hough, president and general manager of the National Lime Association, show progress:

Today we have a far better industry than we had a few years ago, and I raise my voice and say thanks to NRA. I do not mean to say that from the viewpoint of ethics and sound practices our industry is perfect, but I do mean to say that much which was advocated has actually been accomplished through the operation of a code. It makes little difference whether it took emergency action on the part of our Government to bring this about; the fact is it has been accomplished in large measure and for that we should all be thankful.

As we look back over the past year when

so many people, and especially men in business, were asking "Are we on the Right Road?" or "Where does this road go to?" there was never any doubt in my mind that in so far as our industry was concerned, we were on the right road. A marked degree of stability in marketing had finally come to us in large measure. The old practices which had raised havoc for so long had been left behind and a manufacturer was in a position to quote intelligently with a considerable degree of assurance that he would be competitive. Although there were some in the industry who objected to the restraint as established by the code, nevertheless, from a marketing viewpoint the industry was on firm ground.

No matter what may be our future relation to the Government, our mutual relationships are clear. I am sure that every lime manufacturer today has a keener realization than ever before of the problems of the industry which are common to all, a deeper sense of his responsibilities as an individual and as a member of the industry and a greater appreciation of the direct benefits of cooperative effort in solving our internal problems. This has come about during the past two years chiefly through a frequent interchange of thought and opinion, and the full dissemination of vital factual information without which no business man can steer a course intelligently. As manufacturers we have learned much about the other fellow's problems since 1933, and out of this has come a sympathetic understanding, a meeting of minds, a harmony of viewpoints, and a unity of purpose which no court decision can or will destroy.

There need be no hesitation because our Code has been disqualified for there is much that remains. The Supreme Court did not and could not take from us an indomitable will to market our goods soundly, and I know of but a few members of the industry who would want to return to the old rough and tumble methods. I believe that the will of the industry will prevail, and it is for that reason I say and emphasize that our industry, as a whole, is now upon a higher and better basis.

The rest of President Hough's address dealt with the promotional work of the National Lime Association and its successful results in developing tonnage, even during the depression.

Legal Problems

The counsel of the National Lime Association is Abram F. Myers, who has had long experience in United States law; he was for a number of years a member of the staff of the Attorney General, or Department of Justice, subsequently a member and chairman of the Federal Trade Commission. He assisted in drafting the code of ethics approved for the lime industry by the Federal Trade Commission, and afterward assisted in drafting and revising the industry's NRA code. Mr. Myers explained some of the legal phases of the amended recovery act and of the Supreme Court decision as follows in some extracts from his address to the lime industry:

For two years under NRA industry experienced what it had long sought and thought it wanted; but viewed with mingled feelings of regret and relief the abrupt termination of the experiment.

The lime industry like many others derived

substantial benefits from its code; but it paid a price in yielding so large a measure of control to the ambitious, inexperienced and in some cases unfriendly administrators of NRA.

The Government granted relaxation of the antitrust laws and undertook a half-hearted and inadequate enforcement of the codes, but in return demanded and received a dangerous control over the business itself in achieving concepts of social justice and economic reform which could not constitutionally be imposed as laws and which are of questionable value as aids to recovery.

The loyalty of this industry must be divided as between measures like NRA which make for temporary stability and measures which make for eventual industrial recovery. Some of the apologists for NRA have asserted that it was both a stabilizing and a recovery measure. This claim has been sharply challenged in the only independent and disinterested survey thus far made, namely, the Brookings Institute report. In fact that report finds that the net effect of NRA was to retard rather than to promote industrial recovery.

Those who thought that with the striking down of the Code system all hope of recovery was lost will find encouragement in the thought that the principal gains under NRA were the direct results of the contributions of the industries themselves and that the illegal, dangerous and retarding factors were largely the contributions of the Government.

I have heard many business men say that the codes were successful because they were enforceable, but the decision of the Supreme Court shows that this was not an actuality; and we all know that no real effort was made at any time to enforce the codes. I am within the facts and offer no criticism when I say that more time and effort was spent in avoiding a test of the constitutionality of the law than in prosecuting infractions of the codes.

Therefore, the gratifying degree of compliance achieved by the lime industry under its code was the direct result of the restraint, self-discipline and will to obey manifested by the members of the industry, and I am not going to detract from that splendid record by hinting that it was the product of a haunting fear of something that was not real and which we knew deep down inside of us did not exist.

No, it was not fear of the pains and penalties of the law that deterred the members of the lime industry from violating the code; it was a deep-seated conviction that the cooperative measures provided in the code were for the good of each subscribing member and the industry as a whole.

What justification is there, therefore, for the fear so often expressed that this industry can not achieve the same degree of success under a voluntary agreement as under a code whose sanction depended upon a promised enforcement, which was not forthcoming, of a pretended law which was a nullity?

Industry now comes into its own; it must now do for itself that which experience has proven the Government cannot do for it.

An appropriate slogan for the situation in which we find ourselves is, "Hats off to the old order; coats off to the new."

Congress has repealed those provisions of Title I of the National Industrial Recovery Act which attempted to delegate to the President authority to approve or prescribe codes. The remainder of the act was extended until April 1, 1936. Included in the portions of the act thus extended is Section 4 (a) authorizing the President "to approve voluntary agreements between and among, persons engaged in a trade or industry * * * relating

to any trade or industry, if in his judgment such agreements will aid in effectuating the policy of (the National Industrial Recovery Act) with respect to transactions in or affecting interstate commerce."

As in the case of the codes these voluntary agreements must be consistent with the requirements of clause (2) of subsection (a) of the Act providing that they "shall not be designed to promote monopolies or to eliminate or oppress small enterprises and will not operate to discriminate against them" and so forth.

The Borah Amendment

Up to this point the limitations on the right to make such agreements and the exemption from the operation of the antitrust laws are the same as applied in the case of the codes. However, the Joint Resolution was delayed by a combination of circumstances so that in the end it had to be pushed through with a minimum of study and consideration. At the eleventh hour the Senate, distracted with a filibuster along with its other troubles, adopted the so-called Borah Amendment, and the House of Representatives had no choice but to accept it.

The amendment follows:

Provided, that the exemption provided in Section 5 of such Title (that is, the exemption from the antitrust laws) shall extend only to agreements and action thereunder (1) putting into effect the requirements of Section 7(a) (that is, the collective bargaining clause), including minimum wages, maximum hours, and prohibition of child labor; and (2) prohibiting unfair competitive practices which offend against existing law, including the antitrust laws, or which constitute unfair methods of competition under the Federal Trade Commission Act, as amended.

Senator Borah is the oldest senator in point of service—the dean of the Senate. In the course of his career he has made some of the most eloquent speeches heard in the Senate. So far as I am aware, however, no legislative provision has heretofore been coupled with his name. It is a common saying in Washington that there is no "Borah Act." It seems a pity that after all these years his name should finally be coupled with a provision which, whatever its purpose, leads to an absurd result.

Reduced to its essence the amendment provides, so far as exemption from the antitrust laws for trade practice agreements is concerned, that such exemption shall extend only to agreements to obey law.

In a way this amendment is just retribution for the pious pretenses of certain business men and their representatives in seeking to convince the Committees of Congress that NRA was needed to provide protection for agreements against child labor and to secure social objectives of Section 7(a), when the committees were fully aware that what these Pecksniffs of industry really wanted was positive sanction for their open-price and other competitive practices.

However, the situation is not as hopeless as at first blush it might appear. Many a poorly conceived act has been given a sensible interpretation and administration. The amendment does not say the President may not approve industry agreements which go beyond Section 7(a) and the Group I Rules of the old Trade Practice Conference Procedure. It merely says that other clauses in such agreements shall not be exempt from the antitrust laws. Legally this leaves us where we were prior to NRA; practically it leaves us in a much more advantageous position.

During our two years' experience under the NRA many constructive and desirable agreements and practices, formerly regarded as in the twilight zone of the law, have come to be recognized as necessary and proper in the

public interest. There is no reason why the President should not approve as parts of an industry agreement provisions which have worked successfully and satisfactorily as parts of approved industry codes. To refuse to approve such provisions now would certainly dim the jewels of consistency. It is difficult to believe that the President would take any such attitude; if for no other reason, because it would constitute a tacit admission that the codes had in fact violated the antitrust laws.

Now it is evident that the mere approval by the President of a clause in a voluntary agreement which does not conform to the Borah Amendment will not of itself confer immunity under the antitrust laws. Theoretically the Attorney General in a burst of misdirected energy and taking a fine sight on the Sherman Act could nevertheless embark upon a campaign of reckless trust-busting. But the Attorney General is but the right arm of the President and it is inconceivable that he would prosecute for doing that which the President has approved. The worst that could reasonably happen under such circumstances, if there was a difference of opinion between the law enforcement officers and the industry in respect of some particular industry operation, would be for the public authority to explain its position and afford the industry an opportunity to conform thereto before taking drastic action.

And in this connection I again remind you that industry has made progress under NRA in convincing the representatives of the Government as well as the public that the fair trade practices for which industry has been striving are not inimical to the public welfare. This was strikingly demonstrated by the debates in both the Senate and House on the NRA extension measure. Senator Couzens asserted, without contradiction, that price fixing was not tantamount to price fixing. In the House it was conceded that liquidated damage clauses could be embodied in the voluntary agreements. Apparently it is no longer regarded as a suspicious circumstance that two competitors attend the same church; which aptly characterizes a point of view which once existed in official circles.

* * * * *

At best this voluntary agreement submitted to you will be only a stop-gap. The present act will expire on April 1, 1936. The President in signing it indicated quite plainly that he would in the meantime seek permanent legislation. I hope and predict that at your next annual gathering you will be engaged in creating something more enduring. But you cannot postpone action until that time. You must carry on now or all the benefits you have gained will be lost. And you should take particular pride in doing this. The Government is no longer a wet nurse. You are on your own from now on. You are on trial. You must demonstrate that you have the character to curb your own cupidity to the extent necessary to make a success of this undertaking. You must cease calling for the "cops" and police your own industry. If you again call on the Government, it will move in and stay, and you will have something very much worse than you have ever had in the past.

What about the more direct and substantial efforts looking towards industrial recovery? Stabilizing markets and maintaining labor standards do not of themselves create more business. While General Johnson appears to have secured for NRA a copyright on the word "recovery," these are not recovery measures. In your enthusiasm for an industry agreement do not neglect the factors which make for a greater volume of business. I refer to the splendid promotional work being carried on by the National Lime Associ-

ation. You must expand your markets, you must battle substitute materials, you must find new uses for lime. These efforts must not lag but must be prosecuted with increasing vigor. The Lime Association does not have the membership it deserves. It is to be hoped that you will devote some of your energy and zeal during the ensuing year to missionary work in behalf of your trade association and its work.

Voluntary Agreements and Enforceable Fair Trade Practices

A second speaker on legal phases of the voluntary agreement, remarkably well qualified to discuss his subject, was William H. Davis, attorney, New York City, former national compliance director of NRA. Mr. Davis, ROCK PRODUCTS readers may recall, addressed the conventions of the National Crushed Stone Association, the National Sand and Gravel Association and the National Slag Association in Chicago last January on the subject of NRA code enforcement.

Mr. Davis said he believed all industry desired to retain some of the good things they had achieved under NRA, and these good things he listed as (1) minimum labor standards; (2) elimination of oppressive and unfair business practices and abuses; (3) rules of business conduct recognized as desirable and helpful for the well-being and prosperity of the industry; (4) publicity, or enlightenment through the collection and dissemination of an industry's statistics.

Labor Provisions

Discussing these objectives of industry in detail, Mr. Davis said that the first (labor standards) was attainable by voluntary agreement since the NIRA, as amended since the Supreme Court decision, provides that such agreements shall be exempt from the antitrust laws. Regarding approach to this problem Mr. Davis said:

In the first place, you have got to formulate the standards that are to be embodied in the agreement. You may start off by taking those in the present code, but ultimately you will have to revise them, and that means that you have got to have some agency in the industry for determining the minimum labor provisions and for policing them under whatever sanctions the agreement provides for—and, I think, from my experience in NRA, for considering requests for exemptions in particular cases and for considering proposed amendments.

This means, I think, some kind of a minimum labor standard board in the industry, and as soon as you think of that, you must think of including on that board a representative of the workers, and probably a non-partisan, impartial member or members in addition to representatives of the employers.

Now, it is clear that such cooperation with the workers and such a board implies at least some minimum organization of the workers in the industry. I know very well that the idea is prevailing that any organization of the workers might become so powerful as to be dangerous to the best welfare of the industry. On the other hand, I am very definitely convinced that some organization of the workers is a condition that must be faced, and, even, I think, welcomed.

I am not going to give you a talk on labor organization, beyond saying this: That after all, in the long run, no one can deny the

intrinsic right of the employees to self-organization for collective bargaining. That right was recognized by the Federal Government in the Coolidge Administration, in the original Railway Labor Act. It was twice recognized under the Hoover Administration, in the Anti-Injunction Act, and the Bankruptcy Act, and it has twice been recognized in the Roosevelt Administration, in NRA, and in the amended Railway Labor Act. * * * We all know that there are in the country self-seeking and radical labor organizations and individuals, and in my judgment the only effective control of these is by setting up responsible, rational labor organizations, in some form, encouraged by the industry.

Unfair Trade Practices

Mr. Davis said that the only enforceable trade practice provisions under the present set-up are those "tainted by fraud or coercion or misappropriation of what equitably belongs to a competitor, such as disparagement of a competitor or of his goods, obstructions of a competitor's customers, false advertising, appropriation of trade-marks, trade-names and trade-words falsely describing location or product, commercial bribery, misrepresentation of quality, adulteration of goods, interference with source of supplies, local price-cutting to drive a competitor out of business, unfair comparison of prices, competition actuated primarily by malice or revenge, and so forth."

But, as Mr. Davis pointed out, the Supreme Court has given the term "unfair methods of competition" a broader meaning in connection with the Federal Trade Commission Act; its exact scope can be determined only in specific instances by judicial interpretation. This leaves the door open to industry to enlarge upon prohibited trade practices through specific complaints filed with the Federal Trade Commission.

As to fair trade practice rules of a positive character, such as directing the members of an industry to do business along agreed upon lines, these Mr. Davis assured his audience were definitely unenforceable. The line between the two kinds of trade practice rules is not easy to define. The immediately available means is to ask the Federal Trade Commission. Mr. Davis thinks that experience under NRA has liberalized the attitude of the Federal Trade Commission and the courts, so that industry will get a more sympathetic hearing; and he thinks sincere attempts will be made to find out what the antitrust laws really mean—this might take the form of a board or commission "empowered to say that in its opinion, a certain practice, voluntarily agreed to by members of an industry, does not violate the antitrust laws" * * * "and having said that, on recorded facts, it would be provided that the persons who follow that practice will be relieved from criminal prosecution, or from treble damage suits, under the antitrust laws." The ultimate determination of whether the effect of the rules is to violate the antitrust laws would rest, as it does now, with the courts, subject to an injunction, but unlike the present, with no penalty or criminal prosecution.

Mr. Davis then attempted to show the Su-

preme Court's interpretation of "interstate commerce," and such things as affect it to a degree to justify national legislation, and how problems involving these could be handled much in the same way as the determination of legitimate fair trade practice rules.

The gathering and dissemination of trade statistics, he pointed out, has already received the approval of Supreme Court decisions.

In conclusion Mr. Davis quoted from President Roosevelt's remarks of about two years ago, with which, as he says, most of us agreed:

The Government ought to have the right, and will have the right, after surveying and planning for an industry, to prevent, with the assistance of the overwhelming majority of that industry, unfair practice, and to enforce this agreement by the authority of the government. The so-called antitrust laws were entered into to prevent the creation of monopolies and to forbid unreasonable profit to those monopolies. That purpose of the antitrust laws must be continued, but these laws were never intended to encourage the kind of unfair competition that results in long hours, starvation wages, and overproduction.

One of the great restrictions upon such coöperative effort up to this time has been our antitrust laws. They were properly designed as the means to cure the great evils of monopolistic price fixing and should certainly be retained as assurance that the old evils shall never return, but the public interest will be served if, with the authority and under the guidance of the government, private industry is permitted to make agreements and codes insuring fair competition.

Mr. Davis thought the President and the rest of us could accomplish these objectives without amending the constitution or without reversal of the Supreme Court's decision on NRA.

Housing Programs

Wharton Clay, special assistant, Industries Division, Federal Housing Administration, Washington, D. C., addressed the convention on "What the National Housing Act means to the Lime Industry." He pointed out that the Federal Housing Act was not primarily an emergency measure but a reform measure as regards financing real estate improvement and development—mortgage reform. He then explained the act in some detail, calling particular attention to the recent amendment, which permits loans up to \$50,000 for industrial and commercial buildings. He thought a fair measure of the potential market for repairs and alterations was \$10 multiplied by the population. His talk, as a whole, should be useful to all whose market depends on building construction.

Research

Walter C. Voss, professor of building construction, Massachusetts Institute of Technology, speaking on "Research and the Lime Industry," outlined what had been done and what had been learned about lime mortar mixtures so clearly and so convincingly that even some of the doubting Thomases in the lime industry itself were won over. Some things brought out in his talk, not previously publicized, included microscopic study of very thin sections (slides) of the bond between

brick and mortar, which convinced him that it is hydrated lime that provides this bond. In mortars which do not contain hydrated lime this bonding film simply does not exist. This study came about from his attempt to explain the *why* of better results in preventing leaky masonry walls with mortars containing considerable hydrated lime.

Further research is needed, Prof. Voss said, on expansion and shrinkage of masonry, with both varying degrees of moisture and temperature. Lime mortars are helpful in controlling these factors. From tests of mortar beams there is reason to believe that high lime mortars will be stabilized at a much earlier stage than other mortars.

Something to be developed by further research, Prof. Voss said, is the critical point where lime in mortar makes itself felt. He advocated a continuation of the studies of expansion and contraction, using a special brick to study the effects of mortar on assemblages. At present much difference in results from the same specifications results from lack of knowledge of such assemblages. Specifications should be written to suit the materials. Lime mortar walls should grow tighter with the years. He thought about the best mortar was 1 part cement to 1½ parts of lime.

Association's Promotional Work

The rest of the program was devoted to outlining the character of the National Lime Association's promotional work. Included was the showing of a series of slides with synchronized lecture or talk on "The Sweet Earth—Redeeming the Soil," designed to promote the use of agricultural lime; and explanations of how this type of sales promotion could be extended.

The Lime Industry Safety Contest was also explained, together with statistics to prove that the industry needs some stimulation in accident prevention.

Labor Relations

Charles Warner, president, Warner Co., Philadelphia, Penn., added an unlisted paper to the program on "Labor Relations in the Lime Industry," which it is hoped the association will see fit to have reprinted for the benefit of all industry. Mr. Warner discussed labor relations with the utmost frankness, emphasizing the increasing importance of labor problems, even to the small producer, as never before. The time had come, he said, for management to understand labor's viewpoint and for labor to understand management's viewpoint. He spoke for a real partnership of management and labor for the good of industry and not any form of paternalism on the part of management, which has not and never will accomplish the objective of mutual confidence and understanding.

Slag Given Away

Portsmouth, Ohio: Norfolk and Western Ry. is donating discarded slag ballast to the city for street surfacing. Local press says the railway company's section men load the city's trucks.

Profitable Crushing Plant Dust Collected

Dolcito Quarry Company, Birmingham, Ala., Adds Up-to-Date Equipment

By Bror Nordberg,

Associate Editor, Rock Products

THE DOLCITO QUARRY CO., Birmingham, Ala., which produces limestone for many uses, has long appreciated that its limestone dust was a valuable product. Originally the crushing and grinding plant was equipped with a cyclone collector fed by an 18-in. intake pipe connected with dryer, crushers, screens and conveyors. To improve the efficiency of the plant and to collect and segregate the very finest of the dust, an up-to-date Pangborn No. 29 tubular collector has been installed during the last year. This is used to supplement the cyclone collector as will be described.

The 18-in. collector pipe to the cyclone collector has a 6-in. intake duct connected to the housing of a 4x8-ft. Simplicity vibrating screen and a 4-in. intake over the belt conveyor where it discharges into this screen. As the screened materials fall on three belt conveyors, a 10-in. intake branches out to suck in the dust at each point of discharge. An 8-in. intake is connected to the discharge end of a 6x40-ft. rotary dryer, and another 8-in. intake to the discharge belt conveyor of the Kent mills (pulverizers). The housing of this conveyor is shown in the accompanying sketch. It is made of 3/16-in. sheet metal, fastened to the conveyor frame. A burlap bag over the upper end of the conveyor keeps the dust in but permits the material on the conveyor belt to ride out under it. This belt is the one feeding the screens.

Another 18-in. collector pipe has 4-in. intakes at the sacking machine and over the loading belt under the cyclone dust collector. All the dust from 80 to 100-mesh is caught and removed in the cyclone collector, and the finer dust passes through to the Pangborn collector. This material is 80% through 200-mesh, and was formerly wasted from the

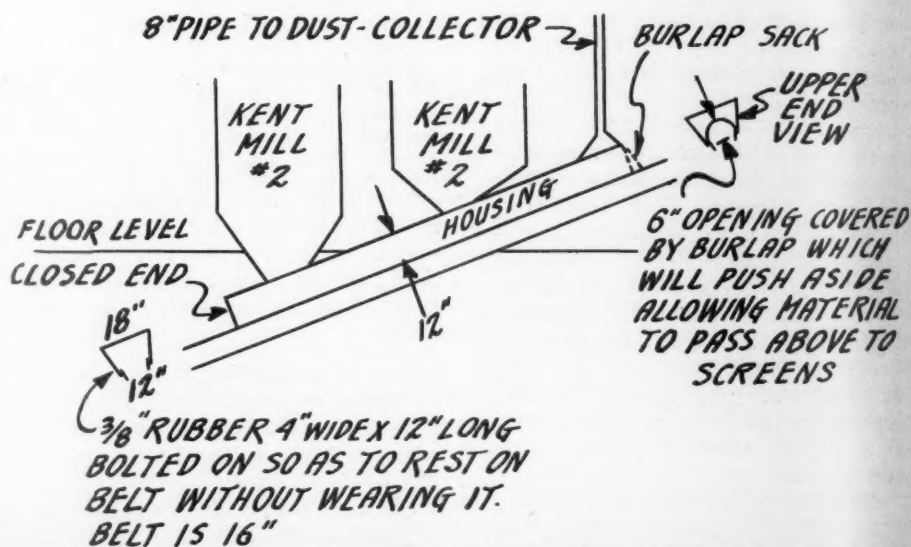
cyclone collector's exhaust. The Pangborn collector contains 640 tubes in four units, which shake down alternately to a 150-ton bin below. From 7 to 8 tons of this fine dust is recovered in a 10-hour day.

One fan, a No. 29 IE Clarage, operating at 860 r.p.m., delivering approximately 18,000 c.f.m., driven by a 50-hp. Lincoln electric motor through a multiple V-belt drive, serves the entire dust-collecting system. The discharge of the cyclone collector goes to the intake of the new Pangborn collector. The Pangborn collector is equipped with an expansion chamber, so that in this instance the cyclone collector merely acts as an additional expansion chamber.

The details are interesting in showing the

possibilities of dust collecting in an old plant. Of course, if the plant were to be rebuilt, it would be designed differently, and many details would be improved upon. Yet notwithstanding the handicaps, an efficient dust-collecting system has been installed.

The 16-in. belt conveyor taking the discharge of the Kent mills passes up a 30-deg. incline a distance of 80 ft. (c. to c.) to the 10-mesh vibrating screens. This belt is in the interior of the plant, of course, where men frequently pass under it. For fear that one of the lower return rollers might drop off and injure some one, a 3/16-in. metal trough has been placed 14 in. below the return rollers, or idlers, which runs the full length of the conveyor. This trough is 20



Above: Rough sketch of dust-collector installation on belt conveyor. Below: Partial view of equipment for reclaiming fines in plant of Dolcito Quarry Co., Birmingham, Ala.



in. wide with edges that are bent up at right angles to a height of $2\frac{1}{2}$ in. It is hung from the conveyor support at intervals by $\frac{3}{16}$ -in. steel straps 18×6 -in.

It was found that the rollers also served to remove the dust clinging to the conveyor belt, and this dust collected in the trough, so to avoid shutting down for an occasional clean-up—and to recover all of a marketable product—rectangular holes were cut in the trough under each idler (12 in. long and the full width of the trough), and hopper shaped inlets to 4-in. pipes were welded to the bottom of the trough, as shown in the illustration. The dust that the return idlers remove from the belt now goes direct to sacks at the ends of these down spouts. About 50 lb. of such dust is reclaimed from each of the seven spouts every 10-hour day—and sold.

The crushed plant consists of a No. 8 McCullough gyratory and a No. 4 Williams Jumbo hammer mill. The hammer mill has been added recently to produce more fines.



Quarry face of operation at Birmingham, Ala.



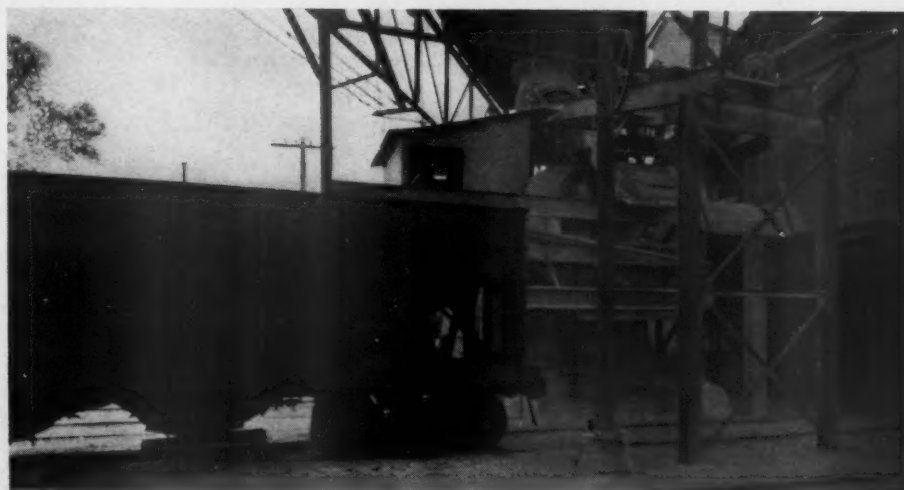
Arrangement to confine dust. Burlap permits movement of material on belt

The gyratory output is fed direct to the hammer mill by a shaker feeder. The discharge, reduced to minus 3-in., is screened on Simplicity 4x8-ft. vibrating screens.

The stone is a dolomite and comes from a quarry worked with a 130-ft. face. Some 19 ft. of overburden is removed by hand labor and mule team in order to make work for otherwise unemployed colored labor. Drilling is done by a $5\frac{5}{8}$ -in. Cyclone well drill. Drilling is done to 5 ft. below the quarry floor and holes are spaced 25 ft. back from the face and 25 ft. apart; 12 holes are shot at one time.



Dolcito Quarry Co. dust collecting installation



Crusher installation of Dolcito Quarry Co.

Longest (?) Field Conveyor Handling Sand and Gravel

By Edmund Shaw,
Contributing Editor, Rock Products



Working from tail pulley and skid for tail pulley, in front

F. H. GATES of Santa Maria, Calif., operates a rock and sand plant on the Sisquoc river, about 15 miles from Santa Maria, in which is what is believed to be the longest field conveyor in regular use. It is 904 ft. from center to center of the head and tail pulleys. There are longer conveyors than this operating in mines and in tunnels in cities, connecting warehouses with docks, but Mr. Gates has not been able to learn of any as long as this which is working uncovered and out of doors.

The belt is 20 in. wide and runs at 338 ft. per minute. It usually carries 120 cu. yd., or 180 tons, of material per hour. The largest

pieces of gravel are about 6-in. diameter. A 75-hp. motor pulls the belt and handles it easily enough after it is in motion, but has all it can do to start the belt with any load.

The frame which holds the belt is of wooden sections 15 ft. long and idlers are spaced 5 ft. apart. These are of three or four different makes, and some have three, some four and some five rolls. There are no guide rolls to strike the edge of the belt. It had not been considered practicable to have a field belt more than 500 ft. long where the frame had to be shifted as the bank was cut. But this conveyor has been running six years, and the greater part of the belt itself is that

originally installed. There are other parts of the belt, of other makes, that were tried, to see which would be the most economical, but they have been worn out and discarded while the original belt has considerable wear left in it after six years. This belting was one which was recommended by the makers after a real study of the conditions to be met.

The idlers have plain cast-iron bearings, and it is believed now that it would have been better to have installed some type of anti-friction bearing from the first. As it is, a considerable part of a man's time is given to greasing idlers, as well as looking after the running of the belt.

The head pulley is on a turn-table because the belt is swung around the head pulley as a center when it is moved over to the bank for a new cut.

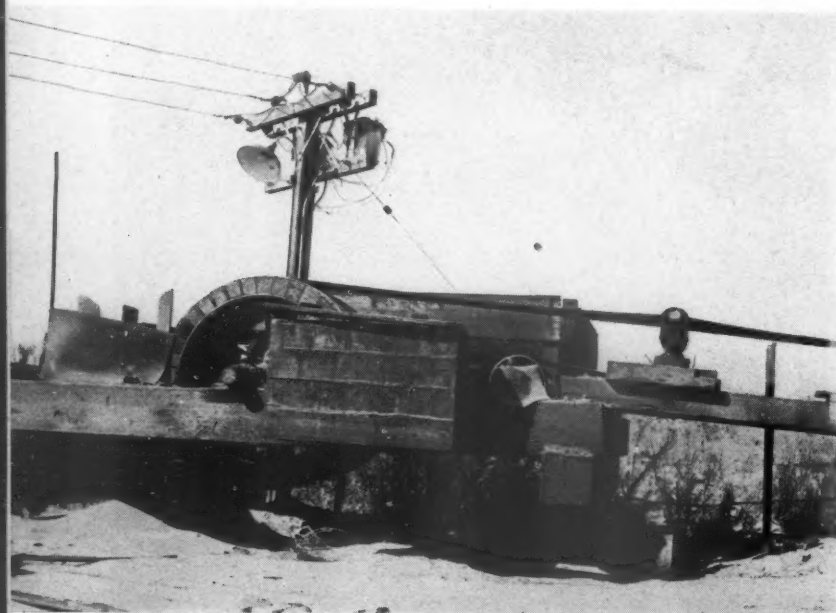
Moving is carefully done. The space between the belt and the bank, where the shovel has been working is first leveled with horse-drawn scrapers. Then the engineer of the company sets stakes with his transit, giving the line and the levels for the belt. And finally the belt is moved over to its new position by being skidded over by teams and men with pinch bars. Care is taken to keep the belt in alignment as well as to set it so, for the working of the belt and its life are largely dependent on this.

When the belt is in use, a hopper straddles it and it is moved along the belt to accommodate the shovel, a "Northwestern." The hopper has a belt feeder with independent motor and chain drive, assuring a regular and even feed to the belt, which is one of the factors of its success.

While this is not a large operation as such are usually rated, the steady running which was made possible by a good market and making a high quality product has given it a larger output during the years of depression than that enjoyed by many more pretentious plants. Several hundred thousand tons have been transported by this belt, and the cost has been considerably lower than it was by the trains of 3-yd. cars and gas locomotives which the belt displaced.

The details of the installation were largely worked out by C. S. Harding, the plant superintendent.

The saving in first cost over two belts was considerable, not only because there were one less motor and two pulleys to buy, but because the whole installation was simpler.



Head pulley on turn-table. Below: Loading hopper that straddles the belt



New Type of Georgia Sand Plant

SMILEY SAND CO., T. M. Smiley, president, Atlanta, Ga., has reopened the old Rollo sand pit, near Gaillard, Ga., formerly operated by him ten years ago, and shipped the first car out June 11. The plant is of entirely new construction, with an aim to portability. There is no overburden in the deposit, which goes to an unlimited depth (well drillings 110 ft. deep do not reach the bottom of the deposit). Two grades of sand, mortar sand ($\frac{1}{8}$ -in. down) and concrete sand ($\frac{1}{4}$ -in. down), are produced.

A 6-in. Georgia Iron Works pump has been set up on cross-ties and is driven by a McCormick tractor (20-30) by means of a belt. Water is supplied from a river branch, which has been dammed up with earth (about 800 ft. of dike 5 ft. high). This water is pumped by a Worthington 4-in. pump driven by an 80-hp., 2-cylinder Caterpillar tractor by means of a 30-ft. centers 10-in. belt. The water is pumped a distance of 1400 ft. to the 15-ft. deep sump dug out in the pit. It is capable of pumping 700 g.p.m.

The 6-in. pump brings the raw material a distance of 250 ft. to a flat screen. A No. 4 mesh or No. 8 mesh is used, according to which grade of sand is desired. The first car pumped was $\frac{1}{8}$ -in. mesh, and the oversizes fell on the ground. Provision is being made by troughs to conduct this material back in the pit. According to the first car, about one-sixth of the deposit being worked is concrete sand. Waste water passes through a 12-in. wooden trough back to the pit, where the water can be re-used. Small bins directly below the screen load directly into railroad cars. The plant will turn out 300 tons per 8-hour day.

Mr. Smiley has installed four of these very portable plants within the last two years, all of practically similar design. Two are located at Chehaw, Ala. Each is equipped with a 6-in. Georgia Iron Works pump, one being driven by a 60-hp. Caterpillar Diesel, and the other by a McCormick tractor (20-30). Another one at Vaughn, Ga., is the same as the one at Gaillard except that it is equipped with an Allen cone classifier.

A fairly recent plant was also installed at Danville, Tenn., with a 10-in. G. I. W. pump driven by a 130-hp. Caterpillar Diesel installed on a dredge hull 102x30x5-ft. It operates on the Tennessee river and has an output capacity of 30 cars per day.

Sand and Gravel News

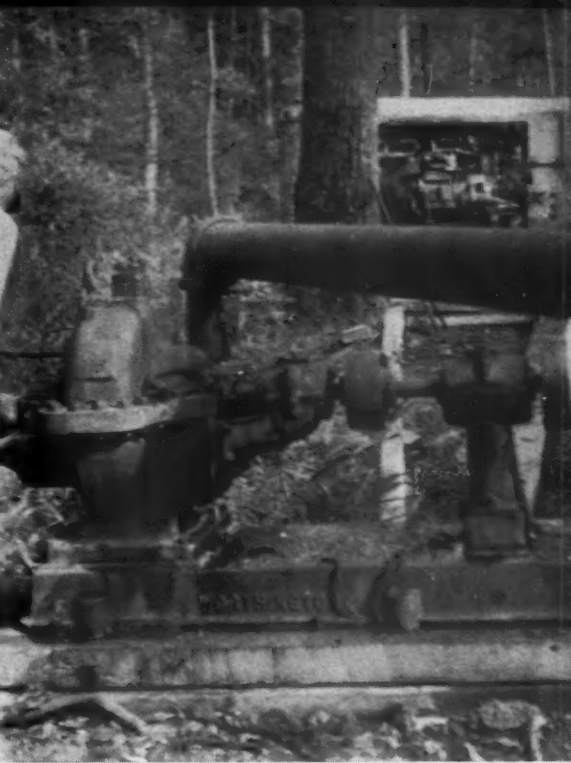
Fair River Sand and Gravel Co., Monroe, La., is the successor of the Arkhola Gravel and Sand Co. and the Stephenson Sand and Gravel Co., Stephenson, Miss. The plants are being rebuilt to produce washed sand and gravel for all purposes.

Quincy, Ill.: In condemnation proceedings in the federal court against J. W.

Caldwell and others, involving land taken by the government in building the Mississippi River dam near Meyer, John Fierke, manager of the Missouri Gravel Co., Hannibal, Mo., testified that in his opinion the property as a sand and gravel deposit was worth between \$700 and \$800 per acre.

Union Pacific R. R. has reopened its famous Sherman hill gravel pits at Buford, Wyo., for ballast production. The pit will be under the direct supervision of William (Bill) Hines of Cheyenne, veteran drag-line operator. Mr. Hines will be general foreman to succeed Frank P. Nelson, Union Pacific yardmaster at Evanston, who formerly left his ordinary position each summer to direct the pit operations.

Topeka Sand Co., Topeka, Kan., a new corporation, has taken over the former Wear Sand Co. The new company, with a capital of \$10,000, was granted a charter and began business at once. The officers are: President, Otis S. Allen; first vice-president, H. S. Blake; second vice-president and manager, F. A. Laughead; secretary-treasurer, W. Wallace Payne; di-



Water supply for gravel pit sump comes from this pump

rectors, other than the officers, George S. Allen and J. M. Rankin. The company will operate two sand plants on the Kaw River, one near the Melan bridge and the other on the north side, opposite Potwin.

Mt. Vernon Sand and Gravel Co., Mt. Vernon, Ohio has moved its plant to the Struble pit, Fredericktown, in order to obtain a better raw material.



*Above: New Smiley Sand Co. plant.
Below: Close-up of pumping unit in pit*



Definition of Portland Cement Causes Discussion— Advancing Knowledge of Materials

Annual Meeting of American Society for Testing Materials

By P. J. Freeman,

Knoxville, Tenn.

THE ANNUAL MEETING of the American Society for Testing Materials in Detroit the week of June 24, 1935, was the 38th annual meeting, and incidentally, the 19th attended by the writer.

Committee activity went forward with the customary vigor, largely under the direction and guidance of members of the Society who were timidly venturing to address the meetings held 19 years ago. Their heads are becoming white or shiny, but they are carrying on; and a new crop of leaders is now somewhat timidly breaking its way into leadership. A number of well-known men in the Society who were directing its affairs at the writer's first meeting are now conspicuously absent. The customary presentation of athletic trophies which was conducted for so many years by "Uncle" Ed Boyer was not a part of this session as it had been for many years.

The attendance at the meeting, as indicated by the paid registration, was 1012, being the third largest annual meeting of the Society and showing an increase over the 823 registered at the 1934 meeting of the Society at Atlantic City.

Methods for Making Chemical Analyses: Committee C-1 on Cement presented a report showing activities during the past year along various lines. Recently a Tentative Method of Chemical Analysis of Portland Cement (C 114-34T) was published by the committee, and the working committee is continuing its study for the improvement of this method. Where the specifications do not require a complete chemical analysis, but place limits upon the amount of magnesia allowable, it is desirable to have a shorter method available than that contained in the present Standard Methods of Sampling and Testing Portland Cement (C 77-32) and therefore, the working committee has been conducting an investigation among a group of laboratories covering quick methods for this purpose. The results indicate that at least two of the shorter methods may be adequate as they appear to be precise and accurate.

A Method for Rapid Volumetric Determination of Magnesia in Portland Cement, by Fred P. Diener, assistant chief chemist, Northampton plant, Universal Atlas Cement Co., and a Method for the Precipitation and Titration of Magnesium Oxyquinolate in the Presence of Calcium Oxalate, and Its Application in the Analysis of Portland Cement and Similar Silicates, by John C. Redmond, Battelle Memorial Institute, Columbus, Ohio, were printed in connection

with the report of Committee C-1 and are therefore immediately available for use by anyone interested in short and accurate methods when a complete analysis of cement is not required. The working committee reported that these methods are presented without definite recommendations other than they appear to be precise and accurate and further investigations are under way.

Low Heat and Blended Cements: The committee is studying the behavior of low heat and blended cements but is not in a position to recommend any specifications. The specification for sulfate-resistant portland cement, which was proposed at the March meeting in 1934 and later discussed at the annual meeting in Atlantic City, has not been recommended by the committee for final adoption as a tentative standard, although mills throughout the country are manufacturing this type of cement and contracts have been placed for many millions of barrels under specifications prepared by the purchasers. Cements complying with the specifications for sulfate-resistant cement as proposed last year are manufactured as a regular product by a number of mills which are fortunate enough to have the raw materials naturally available, so that cement of this type which will meet the specifications of the purchaser and also the standard specifications of the A. S. T. M. cannot command a premium price above the cement now on the market; and the incentive on the part of cement producers to urge the adoption of such a specification is lessened for this reason. The purchasers of such cement are making no demands on the committee for the preparation of the specification which they can prepare along lines suitable to themselves.

High Early Strength Portland Cement: The Committee on High Early Strength Portland Cement presented Tentative Specification (C 74-30 T) for advancement to standard, but when the recommendations reached the floor of the general session on Friday evening, the recommendation that the tentative specification be made a standard was rejected. It was reported that in the meeting of Committee C-1 the question of the definition for portland cement had been brought up before the committee and the chairman of Committee C-1 had been instructed to appoint a small committee to report on the advisability of making changes in the definition of portland cement to cover both normal portland cement and high early strength portland cement.

This action was reported at the general session and a producer of admixtures called attention to the fact that in the manufacture of many products in various lines, it is becoming customary to add small amounts of specially prepared materials, and that the results are beneficial to the products. It was contended by the speaker that a similar condition may exist with portland cement, which would make it desirable to add limited amounts of materials to the clinker during the process of grinding cement. This method is now prohibited under the present definition of portland cement.

The suggestion was made from the floor that the present definition for portland cement be reworded to permit the addition of small amounts of admixtures which the National Bureau of Standards would determine not to be injurious to the cement. The discussion concerning the advancement of the tentative specifications to standard became unusually acrimonious and, after a ballot by actual count of members, the recommendation of the committee was lost, and the specification for high early strength portland cement will remain a tentative standard pending a report of the special committee on definition for portland cement.

New Tentative Standards: During the past year Committee C-1 presented to the Society through Committee E-10 on Standards in addition to the Tentative Method of Chemical Analysis of Portland Cement (C 114-34 T) a Tentative Method of Test for Fineness of Portland Cement by means of the Turbidimeter (C 115-34 T) which has become widely used for the controlling of surface area in the manufacture of cement. The experience of the writer in connection with the testing of a large amount of cement under such specifications indicates that this method is simple and practical and that reasonably accurate results can be obtained without undue effort in the laboratory.

Cement Reference Laboratory: A report on the Cement Reference Laboratory indicated the great improvement which is being made in laboratory procedure due to the work of the Cement Reference Laboratory, and the development of temperature and humidity control in laboratory procedure was pointed out by means of diagrams and photographs. The writer recalls the reluctance with which recommendations were received by the members of Committee C-1, when a proposal was made a few years ago, that more care should be exercised in the control of humidity and temperature; and the illustrated report presented by the committee

from the floor showed that the idea of such control has now become firmly fixed in the minds of the cement laboratory operators.

Masonry Cement: The sponsoring Committee on Masonry Cement is giving consideration to Tentative Specification and Tests for Masonry Cement (C 91-32 T), but has been unable to receive the necessary coöperation and assistance from the manufacturers of this material either as to constructional suggestions or criticisms, so that the method will be continued as tentative for another year.

A paper on Tests of Mortars for Reinforced Brick Masonry, by M. O. Withey and K. E. Wendt, of the University of Wisconsin, covering approximately 82 mixes and 4000 test specimens furnished a very complete set of data which will be of unusual value to those interested in this particular subject. The tests include the use of admixtures under various conditions of curing and show the strength-age and contraction-age relations under these conditions.

Concrete

Committee C-9 reported coöperation with Committee D-4 in the development and changes of specifications and presented a number of proposed tentative standards and revisions of tentative standards as well as the adoption of one new standard. All of the recommendations of Committee C-9 were approved by the Society and they will be submitted to letter ballot.

Proposed Tentative Standards: Tentative Method of Making Compression Tests of Concrete Using Portions of Beams Broken in Flexure (C-35 T): This method permits the use of broken ends from beams used in transverse testing for making compression tests, thus permitting both tension and compression tests to be made on the same specimen.

Tentative Method for Determining Voids in Coarse Aggregate (C 30-T): This method is to be used for making the calculation for percentage of voids based on methods of test which are now Society standards.

Tentative Method of Test for Amount of Material Finer Than 200 Mesh Sieve in Aggregate: This method is intended to combine two present methods, and when adopted as standard, to supersede the present Standard Method of Test for Quantity of Clay and Silt in Gravel for Highway Construction (D 72-21) and Standard Method of Decantation Test of Sand and Other Fine Aggregates (D 136-28).

Revised Tentative Method of Test for Soundness of Fine Aggregates by Use of Sodium Sulfate or Magnesium Sulfate (C 88-T) and Revised Tentative Method of Test for Soundness of Coarse Aggregates by Use of Sodium Sulfate or Magnesium Sulfate (C 89-T): Although these proposed revisions were accepted for submission to letter ballot, it is well understood by the users of these methods that they are not to be considered as complying with the present need of the users and producers of these

materials. This is particularly true for the methods for testing fine aggregate; and, no doubt, the use of these methods will develop extensive refinements in laboratory control for making these tests. The publication of the methods will enable coöperative work among laboratories to go forward.

Revision of Standards and Advancement to Standard: Standard Method of Test for Sieve Analysis for Concrete (C 31-33). Revisions made to this standard do not change the essential characteristics, but merely add details to methods for making the tests.

Specifications for Ready-Mixed Concrete (C 94-33 T): Subject to minor revisions, the present tentative standard specification for ready-mixed concrete was approved by the Society for submission to letter ballot. The revisions are intended to clarify the meaning of such terms as "dry materials," "moisture," etc.

Committee Papers

The report of Committee C-9 also presented papers on Evaluation of Data, which describe statistical methods to be used in studying data and illustrated the method of using a scatter diagram showing the relation between bulk specific gravities of 100 sand samples, and determined by two methods of test, kerosene method and Chapman flask method. The work of this sub-committee will be of interest to investigators desiring to have a mathematical method for evaluation of laboratory test data.

Committee C-9 also presented, for information, a method of test for determining volume changes in concrete by Raymond E. Davis, professor of civil engineering, University of California, which outlines a desirable method in sufficient detail to make it possible for other laboratories to use this method in studying volume change. The committee also reported on the results of tests by H. F. Gilkey, Iowa State College, and H. W. Leavitt, Maine Technology Experiment Station, on comparisons of different types of specimens for compression tests of mortar. The paper presented by Mr. Leavitt pointed out that the laboratories appeared to obtain more concordant results with small prisms rather than by 2 x 4-in. cylinders or 2-in. cubes.

Road and Paving Materials

Committee D-4 on Road and Paving Materials presented the following recommendations, which were accepted by the Society, to be sent out to letter ballot: I. Proposed Tentative Standards: Tentative Volume Correction Table for Asphaltic Products: Tentative Method of Test for Determination of Amount of Material Finer Than No. 200 Sieve in Aggregates.

II. Proposed Revision of Standard: Method of Test for Distillation of Bituminous Materials Suitable for Road Treatment (D20-30), editorial change.

III. Proposed Revision of Tentative Standard: Method of Test for Residue of Specified Penetration (D 243-32 T): Method

of Testing Emulsified Asphalts (D 244-34 T).

IV. Proposed Adoption of Tentative Standard as Standard Method of Test for Ductility of Bituminous Materials (D 113-32 T), as revised.

It will be noted that tentative method of test for determination of material finer than 200-mesh sieve in aggregates is the same as that sponsored by Committee C-9, which indicates the development of a policy begun some years ago in endeavoring to combine methods used by more than one committee under the direct sponsorship of one committee, but with agreement by the other committees that such method is satisfactory.

Tests of Soils for Highway Construction: During the past year a sub-committee on soils for highway construction was organized and placed under the chairmanship of C. A. Hogentogler, of the U. S. Bureau of Public Roads, who, in conjunction with E. A. Willis, of that Bureau, presented a paper on sub-grade soil testing methods before the annual meeting last year, for which they were jointly awarded the Charles B. Dudley Medal at the Detroit meeting this year.

This sub-committee, under Mr. Hogentogler, is very active, and shortly will submit to letter ballot of Committee D-4 the following proposed methods of:

- Surveying and Sampling Soils.
- Preparing Soils for Test.
- Determining the Liquid Limit of Soils.
- Determining the Plastic Limit of Soils.
- Determining the Plasticity Index of Soils.
- Determining the Centrifuge Moisture Equivalent of Soils.
- Determining the Shrinkage Factors of Soils.
- Determining the Field Moisture Equivalent of Soils.
- Mechanical Analyses of Soils.

The work of this committee will place before engineers for the first time prescribed methods for making these tests similar to those which have been published in various places and in various forms by the U. S. Bureau of Public Roads and others, and undoubtedly, will be a contribution to the very live subject of the behavior of soils.

Lime

Committee C-7, on Lime, did not make a report and no formal meeting of that committee was held. A paper on Classification of Hydrated Limes by a Mobilometer, by T. G. Dixon and J. R. Withrow, Ohio State University, was presented by Dr. Withrow. The apparatus developed at the Ohio State University in connection with methods of classifying limes for indicating finishing properties by means of a loaded plunger was described in the paper to be printed at a later date. The informal report of Sectional Committee for Specifications for Plastering stated that progress is being made in the preparation of specifications for Limes to be used for that purpose.

Concrete Pipe: Committee C-13, on Concrete Pipe, presented recommendations listed below. These were all accepted for

submission to letter ballot: I. Proposed Tentative Standard Specification for Concrete Irrigation Pipe: II. Revision of Tentative Standard Specifications for Reinforced Concrete Culvert Pipe (C 76-30 T): III. Adoption of Tentative Standards as Standard Specifications for Non-Reinforced Concrete Sewer Pipe (C 14-34 T), as revised: Specifications for Reinforced Concrete Sewer Pipe (C 75-34 T), as revised.

Papers Before General Meetings

Many papers were presented before the general sessions of the Society, having particular reference to the work being done in the great industrial center of Detroit. Mention of such papers is being omitted from the report of the meeting only because it is assumed that readers of *Rock Products* will be more particularly concerned with those referring to cement, concrete, lime and high-way materials.

Measurement of Particle Size: Those interested in determining surface area and particle size of cement and other fine materials will be interested in the paper by R. N. Traxler and L. A. H. Baum, both from the Technical Bureau, Research Division, Barber Asphalt Co. The paper gives the report of studies made on various limestones, slate and the development of a technic for the dispersion of finely pulverized solids. The results obtained on various powders were compared with the size distribution data given by an air analyzer of the type described by Roller in a paper presented before the Society in 1932. The writers conclude that a direct proportionality does not exist between surface area and turbidity and that for accurate investigation of particle size distribution in mineral powders of the type studied, the turbidimeter appeared to be unreliable, but for the detection of changes of size in a single product, the method has practical value.

Concrete Disintegration: A paper on Research on Concrete Disintegration, by H. S. Mattimore and G. A. Rahn of the Pennsylvania State Highway Department, gave the results obtained from a study of 45 experimental concrete head walls constructed in McKean County, Pennsylvania, about 4½ years ago. Experience in the field had indicated that unusual difficulties were being encountered in that section of the country, and the investigation was begun to compare the results obtained by different cements and sands which were obtainable in that district. A method of evaluating the results of deterioration in concrete structures was presented and unusual information showing the numerous cycles in ground temperature changes which occur during the winter months. The authors of the paper did not attempt to draw definite conclusions, but presented the information as a matter of record for the attention and study of the Society where materials are to be subjected to extreme exposure and rapid alternations in temperature.

New Abrasion Testing Machine: A pa-

per on the Los Angeles Abrasion Machine for Determining the Quality of Coarse Aggregate, by D. O. Woolf and D. G. Runner, U. S. Bureau of Public Roads, created a great deal of interest, not only before the general session, but in various committee meetings held in connection with specifications and testing of aggregates. This machine has been in use in Los Angeles for a number of years and the results of wear test have been correlated with service records. The particular advantages of this apparatus for testing the wear of stone are that the test can be made on material being used in regular construction and it is not necessary to provide samples of uniform size, as is necessary for Deval abrasion machine. Furthermore, the test can be conducted in a few minutes, instead of five hours required for the present abrasion test. These two items alone are sufficient to warrant engineers in giving consideration to this method of testing. The correlation of test data with service records appeared to be good, and in discussing the results presented in the paper, A. T. Goldbeck, National Crushed Stone Association, called attention to the comparison between the results obtained by the Los Angeles abrasion machine with the results obtained in his laboratory using a rotating wheel which produces surface wear similar to that developed under actual traffic. It was pointed out by Mr. Goldbeck that the correlation between the two methods of testing was unusually good and, since the wear test made under the wheel indicates actual field conditions, it would appear that the new abrasion machine would also closely duplicate such data. It is the writer's own prediction that users of crushed rock will look upon this machine as something well worth immediate consideration, and that the Los Angeles abrasion machine, as it is now developed, or in some similar form, will supersede the present Deval abrasion machine.

Concrete Test Measurements: The Determination of Modulus of Elasticity and Poisson's Ratio of Concrete at Ages of Fourteen Days to Four Years, by L. H. Koenitzer, Kansas State College of Agriculture and Applied Science, was presented by C. H. Scholer, as being a continuation of the work of P. M. Noble, which was presented before the Society in 1931.

Tests show that the modulus of elasticity of plain concrete at the end of 4 years is about the same as at the age of 14 days. Poisson's ratio for the mixes studied indicates a rapid increase for the first 56 days, and then a gradual decrease until, at the age of 4 years, the ratio was, in most cases, equal to or less than Poisson's ratio at 14 days.

Sand-gravel aggregate concrete failed to increase in strength; the strength at the age of 4 years was, in many cases, equal to or less than at the age of 28 days.

Sand-gravel aggregate concrete specimens when tested wet gave a lower modulus of elasticity than when the specimens were tested dry. The opposite was true for coarse aggregate specimens. Aggregates have an

important influence on the elastic properties of the resulting concrete.

Concrete Shrinkage: At the final session two excellent papers were presented in connection with the study of concrete shrinkage. A paper by R. W. Carlson, Massachusetts Institute of Technology, on the Chemistry and Physics of Concrete Shrinkage was a very interesting and philosophical treatment of the subject and the author should be commended for his boldness in presenting original thought along these lines. The paper had not been preprinted, so that, unfortunately, the discussion was not extensive, but additional discussion by letter was promised, which should make this paper of unusual interest when published.

A paper on Shrinkage of Concrete, by Inge Lyse, of Lehigh University, showed the results of tests obtained with apparatus similar to that developed by R. E. Davis, and described in the report of Committee C-9. This paper had not been preprinted, and, on account of the extreme lateness of the hour, an ample discussion of the paper was not possible.

Intrastate Surcharge Exemptions

IN West Virginia, intrastate surcharges of the types allowed in interstate commerce by Ex Parte 115 were imposed June 8 but exemption was made of ground and agricultural limestone, building, fire, paving and common brick, and the shipment of sand between certain points.

South Dakota ordered increases for June 15, excepting lignite, sand, gravel, crushed stone and other aggregates usually accorded the same rate, brick and tile, and concrete pipe millwork.

Arkansas ordered increases May 24 except on bituminous coal or coke, sand and gravel or kindred commodities, and cottonseed products.

The state of Washington ordered increase May 8 except on carload shipment of cement.

In Florida the increases except phosphatic rock, phosphatic sand, and agricultural limestone.

In Kentucky the increases allowed exclude bituminous rock, asphaltic sandstone, sand, gravel, and crushed stone.

In Louisiana the increases made exception of pulverized agricultural limestone.

Tennessee allowed Ex Parte 115 increases on commodities other than phosphatic rock, agricultural limestone, and certain non-mineral items.

Alabama increases exempted agricultural limestone, chert, gravel, sand, slag, crushed or broken stone or granite, cottonseed products, and paving or road-surfacing material and lime.

The Alabama U. S. District Court denied Birmingham Slag Co. et al. a preliminary injunction wanted to forbid the railroads to add surcharges on sand, gravel, slag and crushed stone in interstate commerce.

Rock Products News Briefs

Cement

Marquette Cement Manufacturing Co., Chicago, Ill., has issued a new folder on its high early strength cement in which are directions for getting 1500 to 3600 lb. per sq. in. compressive strengths in 24 hours. The folder is designed particularly for those not expert in concrete design, such for example as the farmer and home builder.

♦ ♦ ♦

Three Forks Portland Cement Co., Trident, Mont., is the subject of a "write-up" in the *Helena Progressive*, from which it is learned that the plant is operating to its capacity of 2000 bbl. per day with three shifts of 8 hours and a 5-day week. The minimum wage is 48c and 125 men are employed.

♦ ♦ ♦

Consolidated Cement Corp., Fredonia, Kan., according to a recent announcement, will increase its storage capacity by addition of more silos.

♦ ♦ ♦

Greenbag Cement Co., Pittsburgh, Penn., has appointed Erie J. Ochs superintendent of its Neville Island plant. Mr. Ochs was until recently superintendent of the Standard Portland Cement Co., Painesville, Ohio.

♦ ♦ ♦

Standard Portland Cement Co., Painesville, Ohio, has appointed Harry Stevens, former assistant superintendent, acting superintendent. He succeeds E. J. Ochs, who has gone to the Greenbag Cement Co., Neville Island.

♦ ♦ ♦

Olympic Portland Cement Co., Bellingham, Wash., reopened its limestone quarry early in June, giving employment to 20 additional men.

♦ ♦ ♦

Lehigh Portland Cement Co., Allentown, Penn., is reported to be contemplating improvements at its Fordwick Va., plant to cost about \$400,000, including a waste-heat boiler plant and a dry raw material blending system.

♦ ♦ ♦

Medusa Portland Cement Co., Cleveland, Ohio, resumed operation of its Wampum, Penn., plant the latter part of May as the result of an order for construction of the Tygart dam in West Virginia. The plant had been closed for a long period. It was formerly owned by the Crescent Portland Cement Co. W. P. Rice is superintendent.

♦ ♦ ♦

Aetna Portland Cement Co., Detroit, Mich., has appointed the Manufacturers' Sales and Warehouse division of the Great Lakes Building Materials, Inc., Toledo, Ohio, its agent in Toledo territory. Shipments will be received by steamship.

Pennsylvania-Dixie Cement Corp., New York City, announces the following promotions in its operating and engineering staff: Felix Guenther, Jr. has just been appointed chief engineer, with headquarters at Nazareth, Penn., and Norman V. Geyer, superintendent of Plant No. 1, Kingsport, Tenn. In making the announcement, W. H. Klein, general operating manager of the corporation, said: Mr. Guenther is a graduate of the Case School of Applied Science, Ohio, with many years of experience in the cement industry. For the past nine years he has been general superintendent of Plant No. 1, Kingsport, Tenn.; during the ten years preceding, he was general superintendent of the Clinchfield Portland Cement Co., and prior to that, had acted in the same capacity for other companies. Mr. Geyer graduated in chemical engineering from Purdue University in 1918. After some experience elsewhere, he joined the Penn-Dixie staff at Kingsport in the capacity of chemist. He was later made assistant superintendent and for some time past has been acting as chief chemist and assistant superintendent at the Kingsport plant.

♦ ♦ ♦

North American Cement Corp., Albany, N. Y., in announcing, through J. W. Campbell, superintendent, resumption of operations at Howes Cave plant, said, according to the *Catskill (N. Y.) Times*: "Howes Cave plant is not readily accessible to any large metropolitan markets and is largely dependent for its business on highway construction and on the small use market, that is, the sale to farmers, householders and others for small improvements. This latter market is holding up well but unless New York state succeeds in securing promptly a considerable Federal appropriation for help on its highway program, our volume of business will be meager and our operating schedule may be even shorter than last year."

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"In New York state the total bid price of highway construction has fallen off from approximately \$48,000,000 in 1931 to less than \$18,000,000 in 1934. In 1931 we were able to operate our Howes Cave plant throughout the entire year, whereas in 1934 we had only 160 days of operation."

"The provision made by the assembly for highway work this year is about the same as last year, but since a large proportion of this must go to maintenance work, there will be even less cement consumed on highway paving than in 1934 unless the State should secure a large Federal appropriation."

"The trouble, of course, is diversion of gas taxes, which has always been counted upon to pay the cost of building and up-keep of the roads on which the gasoline is used. I realize that the State has a difficult financial

problem. When Governor Lehman took office the State had accumulated an enormous deficit and he has been making heroic efforts since then to balance the budget and to reduce this deficit. Nevertheless, it would seem that it is wrong in principle as well as in practice to tax one particular class of consumers, motorists, for the general funds of the State. In fairness some broader basis of taxation should be used and contributions of the motorists should be confined to the use for which they were originally intended. The gas tax in effect is a toll charge for the use of roads and it should be spent on the roads."

"The principle of gas tax diversion has been widely recognized as wrong and the states of Missouri and Colorado have gone so far as to pass constitutional amendments forbidding the use of these funds for anything other than road work. The national Congress further recognizes this principle in the Hayden-Cartwright Act which contains a provision that as much as one-third of the Federal aid allotment for roads would be withheld from states which diverted motor tax revenues."

"My company is making every effort to secure the business necessary to keep Howes Cave plant going, but we cannot operate if we do not ship; and as I have previously stated, our shipments will be largely contingent on our success in securing highway paving contracts."

♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦

It is obvious that this is the most effective kind of publicity; it comes from a fellow citizen known to the local newspaper editor; it concerns the welfare of the citizens and the locality; therefore local newspapers are almost always glad to have such statements. In a similar way some of the absurdities of the government's attitude toward public works could be exposed and explained to Mr. Average Well-Meaning Citizen.

♦ ♦ ♦

Statistics: The portland cement industry in May, 1935, produced 8,222,000 bbl., shipped 7,428,000, and had in stock at the end of the month 22,014,000. Production and shipments in May, 1935, showed decreases, respectively, of 3.9 and 15.4%, as compared with May, 1934. Portland cement stocks at mills were 3.3% higher than a year ago. The statistics here given are compiled from reports for May, received by the Bureau of Mines from all manufacturing plants except one. In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 162 plants at the close of May, 1935, and of 163 plants at the close of May, 1934.

RATIO (PERCENT) OF PRODUCTION TO CAPACITY

	May		April	March	Feb.
	1934	1935	1935	1935	1935
The month	37.5	36.1	27.9	18.9	14.9
The 12 months ended	26.7	27.7	27.9	28.0	28.4

A Study of Grinding in Ball Mills and Tube Mills

Made by the Department of Research and Development, Riverside Cement Company

By Howard R. Starke,
Riverside Cement Co., Riverside, Calif.

Introduction

A CONSIDERABLE NUMBER of investigations have been reported, relating to fine grinding in ball mills and tube mills (See references at the end of this article). Most of these studies have been handicapped by the difficulty of obtaining adequate information regarding the particle size distribution of the products of grinding, more particularly that portion of the ground materials which passes the finest practical sieve. For example, the literature yields many references to the grinding of portland cement clinker, in which fineness is given in terms of per cent passing or retained on the 200-mesh screen. Since modern portland cements are so ground that at least 85% will pass the 200-mesh screen, and since it is known that cement particles just able to pass this screen are very feebly hydraulic, it is evident that a statement of fineness in these terms must be inadequate.

In order to obtain more adequate information regarding some of the phenomena of fine grinding in ball mills and tube mills, the Riverside Cement Co., in 1928, developed an accurate sedimentation method, described elsewhere^a, for determining the size distribution of ground materials, and undertook a study of some aspects of grinding.

This paper presents a brief account of the results of some of the work, which was carried out during 1929 and 1930.

Scope of the Work Reported

The major variables studied were (a) the length of the grinding period, (b) size of grinding ball, and (c) initial size of particles to be ground. The material ground was portland cement clinker.

Four grinding mills, described below, were used.

Mill designation.	Diameter, in.	Length, in.	R.p.m.	Mill torque measurement.	Type of feed
"J" mill	12	9	35	No.	batch
"Y" mill	10	12	(*)	Yes	batch or continuous
		and 30			
"B" mill	36	36	(*)	No.	batch
"L" mill	36	48	(*)	Yes	continuous

*Variable.

Major Conclusions

Within the conditions of these tests, the following generalizations may be stated:

(1) During the early periods of grinding in batch mills, the specific surface of the charge increases nearly in proportion to time, but during later periods the rate of increase of specific surface tends to diminish.

(2) Mill efficiency is influenced by varia-

Author's Acknowledgment

THE experimental work which provided the data of this paper was initiated by Dr. Robert T. Knapp, of the California Institute of Technology, who was then employed by the Riverside Cement Co. It was under his supervision that the data of Plots 1, 2 and 3 (further shown in Plots 13 to 22 inclusive) were secured. The analysis of these data is in part similar to that made by Dr. Knapp, but the author assumes sole responsibility for the conclusions as stated herein. Also, the exponential ratio for expressing the most effective relationship between initial particle size and ball diameter is a modification of one proposed by Dr. Knapp, the modification having been made necessary by the weight of the later evidence.

The writer is also indebted to Hubert Woods and Harold Steinhour, director and member of staff, respectively, of the Research Department of the Riverside Cement Co., for their valuable counsel. The former was a particularly active helper during the planning and progress of the work.

—THE AUTHOR.

Analytical Methods

The size distribution of each product was determined by the device referred to^a. This device determines particle size distribution according to the sedimentation principle relating particle size to the velocity of free fall through a fluid medium. Since the size distribution of a ground material is not a single numerical value, while for some purposes it is desirable to express fineness as a simple number, the specific surfaces of all ground products were calculated.

For purposes of calculation, it was assumed that a given weight of particles with diameters between d_1 and d_2 present the same surface as an equal weight of spheres of the

mean diameter, $\frac{d_1 + d_2}{2}$. Diameter of a particle was considered as the length of a side of the smallest square opening through which it would pass. Observations were made at 8, 10, 15, 20, 25, 30, 40, 50, and 60 microns size and at each sieve size in the Tyler standard series. It was further assumed that the effective mean diameter of the particles smaller than 8 microns (the lower limit to which routine sedimentation analyses were carried) was 5.35 microns.

The Data—Influence of Length of the Grinding Period

(1) In the early periods of batch grinding, the surface of the product is increased practically in proportion to the length of the period. During later periods, the tendency is for progressively less surface to be produced per unit of time. Figs. 1, 2 and 3 show the data. The ordinate of the figures is surface per gram (specific surface) of the product. Multiplication of the ordinate scale by the total weight of the product, which was a constant throughout grinds, shown on a figure, would convert the ordinate to total surface of the product. The curves are practically straight lines for the first 1500 mill revolutions. Most of them curve downward during the later period.

(2) The grinding effectiveness of a given size of balls is markedly influenced by the initial size of particles being ground. Grinding effectiveness is indicated on Figs. 1, 2, and 3 by increase in specific surface during the grinding period considered. This increase is not shown directly by the figures but is obtained by noting the difference between the initial surface of the unground particles and that of the ground particles.

tion in the rate at which material is fed to a continuous discharge mill.

(3) A mill is most efficient in producing surface from the material used in these tests when the ratio

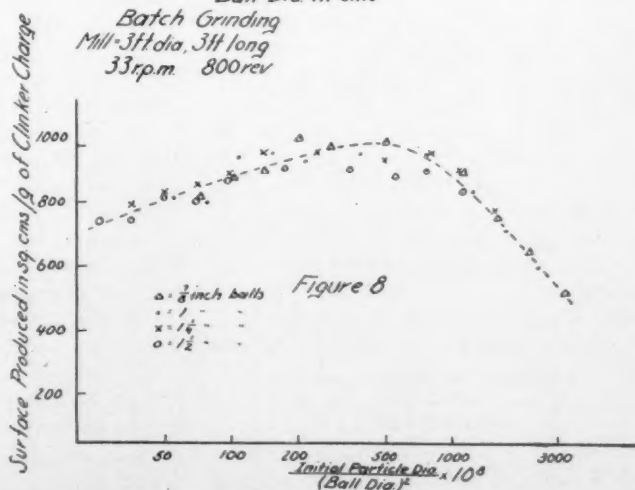
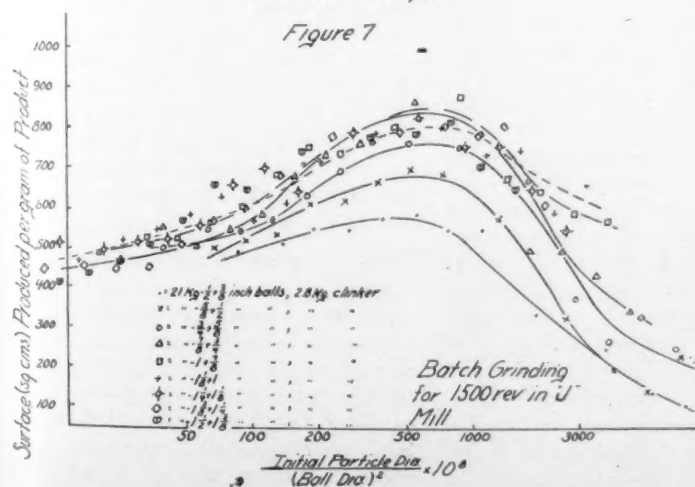
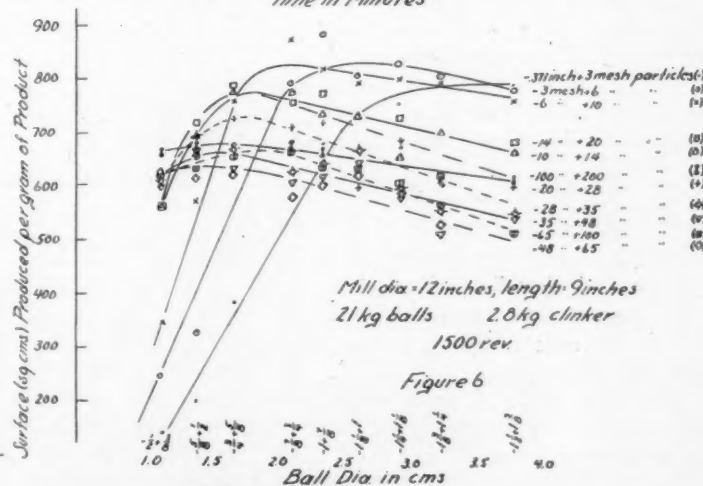
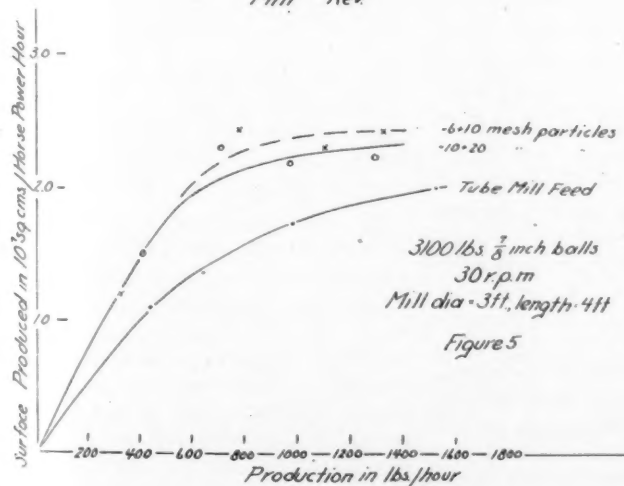
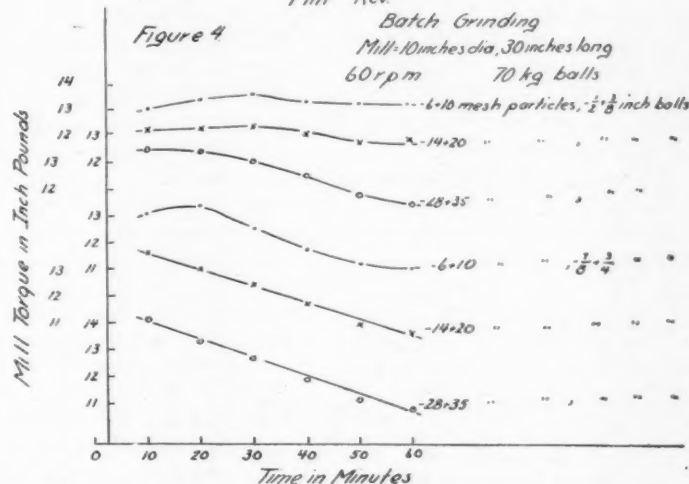
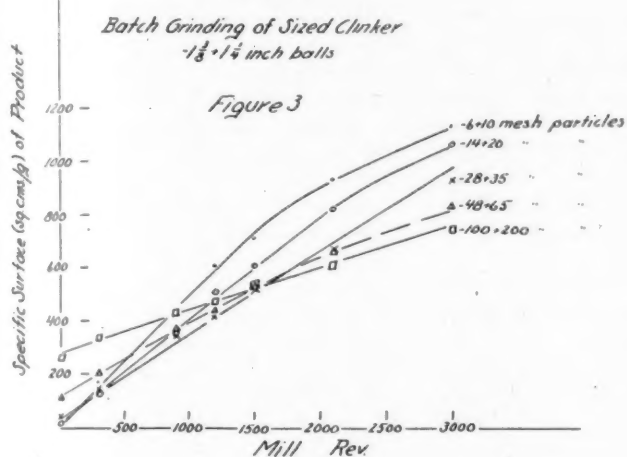
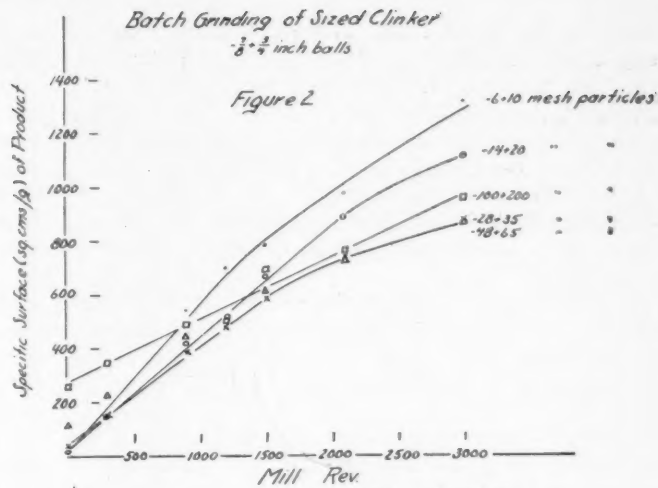
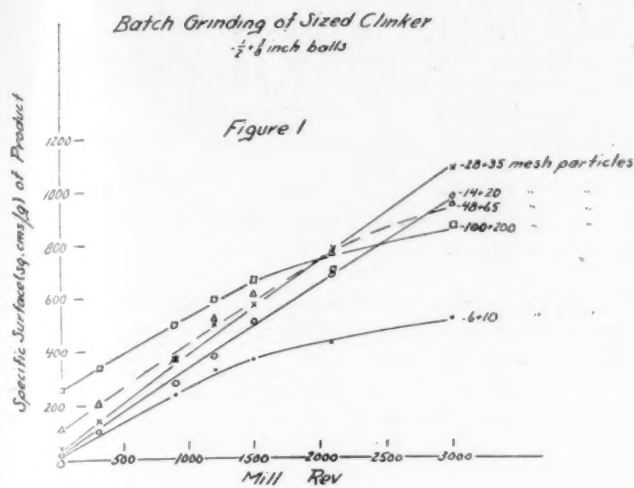
$$\left(\frac{\text{Initial particle diameter}}{(\text{Ball diameter})^2} \right)$$

(diameters expressed in microns) is about 600×10^{-6} . (The optimum value of this ratio apparently depends upon the physical characteristics of the material to be ground.)

(4) Products of grinds at low ratios have appreciable weights of all particle sizes smaller than the charged size while those of grinds at high ratios have a very small weight of particles between one-tenth and one-half the charged size.

(5) By scalping the product at commercially feasible particle sizes, high grinding ratios usually yield products of highest specific surface.

(6) Materials of equal specific surface will generally have particle size distributions more nearly alike when produced at equal grinding ratios.



A study of grinding in ball mills and tube mills—Figs. 1 to 8, inclusive

Thus in Fig. 3, the initial surface of the unground — 100+ 200 mesh clinker was appreciably the greatest, while, the specific surface of the final product was lowest.

(3) Those balls having diameters between $\frac{1}{2}$ and $\frac{3}{8}$ in. ($-\frac{1}{2} + \frac{3}{8}$) are more effective when grinding a charge initially of about — 28+ 35 mesh clinker than when grinding a charge initially of larger or smaller particles. (See Fig. 1.)

(4) The data indicate that the effectiveness of a given size of grinding balls varies during a given batch grind. It was previously shown that the grinding effectiveness of a given ball is markedly changed by a change in the size of particles put in the mill. As grinding proceeds, the initial particles are broken into smaller sizes. Obviously then, as grinding proceeds, the size of particle being acted upon by the grinding balls changes, probably resulting in a continuous change in grinding effectiveness during a given grinding period.

(5) In batch grinding, mill torque varies during a grind and the manner of that variation appears to be, in part at least, dependent on the size of particles put in the mill. This is shown by Fig. 4. These data show that mill revolutions, as shown by the abscissa of Figs. 1, 2, and 3, are not strictly proportional to energy used by the mill.

(6) Mill efficiency is influenced by variation in the rate at which material is fed to a continuous discharge mill. (See Fig. 5.)

Production rate for a continuous discharge mill is analogous to mill revolutions for a batch mill. High production rate corresponds to a small number of mill revolutions. Fig. 5 shows the type of data presented in the first three figures on an equal energy basis.

(7) Mill efficiency is influenced by the size of particles fed a continuous discharge mill. (See Fig. 5.)

A New Ratio Law

(1) There is a particular size of particle that can be most effectively ground by a given size of grinding ball.

Each curve of Fig. 6 represents a given size of particles and shows the amount of surface that was produced in the "J" mill during 1500 revolutions when differing sizes of balls were the grinding media. The following example illustrates more fully these curves. If it is desired to obtain the greatest amount of grinding in the "J" mill during 1500 revolutions when particles of — 6+ 10 mesh size are to be ground, it is found by reference to Fig. 6 that the highest point on the — 6+ 10 mesh particle curve comes at that point over the — $\frac{7}{8} + \frac{3}{4}$ in. size balls, which would then be used as the grinding media.

(2) When the amount of grinding done is plotted against the ratio of

$$\frac{\text{(Initial particle diameter)}}{\text{(Ball diameter)}^2}$$

(in this work diameters are expressed in microns) it is found that each size of ball

is most effective at approximately the same ratio value. This is shown by Fig. 7. For the conditions shown, the most effective ratio is approximately 600×10^{-8} . Knowing this optimum ratio value and given a ball size, it is possible to calculate the size of particle that can be most effectively ground by that size of ball or vice versa.

Fig. 8 shows this ratio relationship for a larger batch mill.

The ratio relationship holds when the amount of grinding per unit of mill torque is plotted against the ratio. The curves in Fig. 9 show the same shape and approximately the same optimum ratio value as those of Fig. 7. The ordinate of Fig. 9 is total surface of the product divided by mill torque. In Fig. 7 the ordinate is convertible to total surface of the product by multiplication by the weight of the product, which was the same for all grinds shown in Fig. 7.

The ratio relationship also held when a continuous feed and discharge type of mill was used. This is shown by Fig. 10. These data were obtained with a mill of semi-commercial size. Due to the large quantity of material being handled and the size of the equipment, these results are not as precise as those obtained on smaller mills. Further data, not shown here for lack of space, confirm those shown in Fig. 10.

Figs. 9, 11 and 12 present some representative data showing that the ratio relationship holds for a wide range of mill, speed, clinker charge weight and ball charge weight.

Grinding Ball Efficiency

Under the conditions of these tests, balls smaller than $\frac{7}{8}$ in. appear to be less effective as grinding media than balls of this size or larger. (See Fig. 7.)

Size Distribution of Products

Size distribution is graphically presented in the form of a frequency plot. Points on these plots are the per cent by weight of particles within a given size range divided by the extent of the range. Each value so calculated is plotted at the mid-point of the range which it represents. For example, 10 per cent by weight of particles smaller than 20 and larger than 10 microns would appear as 1 per cent per micron at 15 microns particle size. The plotted points alone have significance, the curves serving only to assist in following a series of points. These plots serve to show the weight concentration of a sample as to size of particles.

(1) Grinding at ratios appreciably larger than the optimum results in products with very small weights of particles between one-half and one-tenth the original size. In other words, the product is composed essentially of practically original sized particles and very fine particles. (See Fig. 13.) Figs. 14, 15, and 17 show products resulting from grinds at about the optimum ratio.

(2) Grinding at small ratios (about 100×10^{-8} or less) results in products with appreciable weights of all particle sizes smaller than the original size. (See Figs. 16, 18, 19, 20, 21, and 22.)

(3) By scalping at commercially feasible particle sizes, high grinding ratios usually yield products of highest specific surface. This is merely a restatement of the previous discussion, being true because such scalping would remove from products of high ratio grinds those particles of approximately original size, leaving only very fine particles. Fig. 23 shows the specific surface of the — 20 mesh portion of the products from grinds at several ratios. These data are from the semi-commercial sized continuous feed mill.

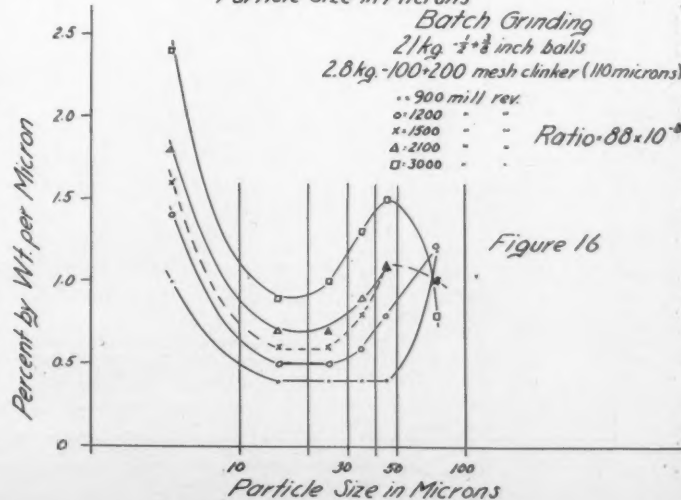
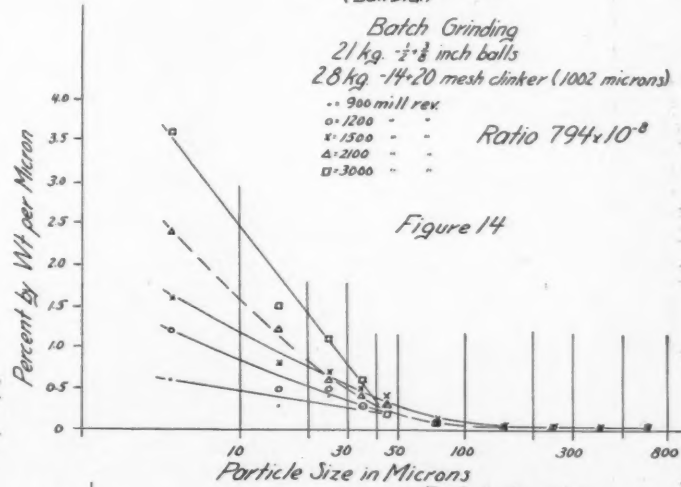
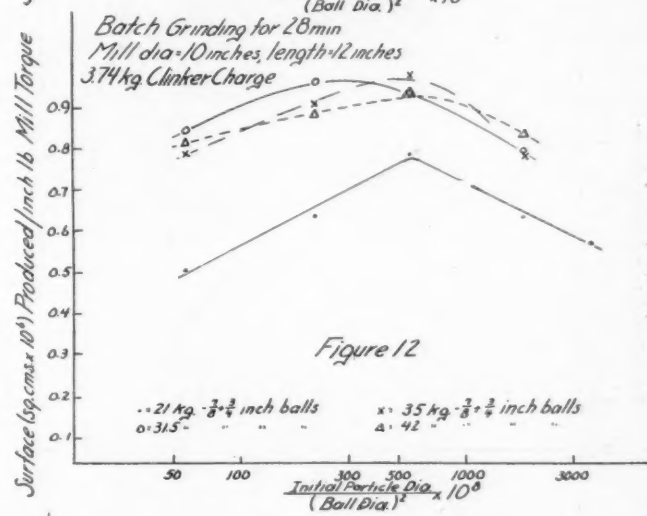
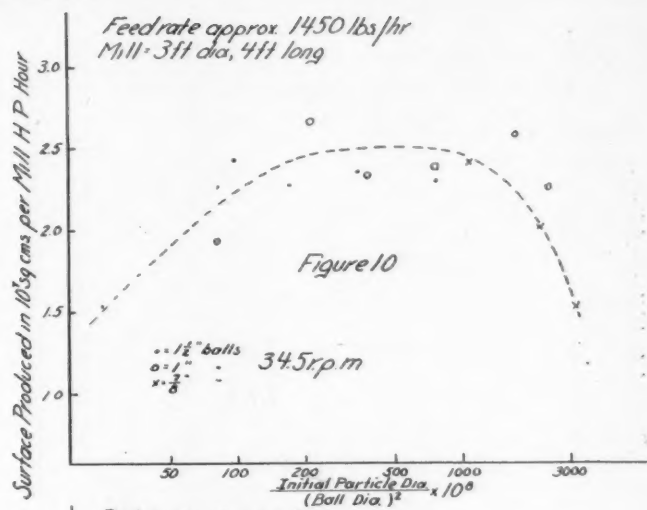
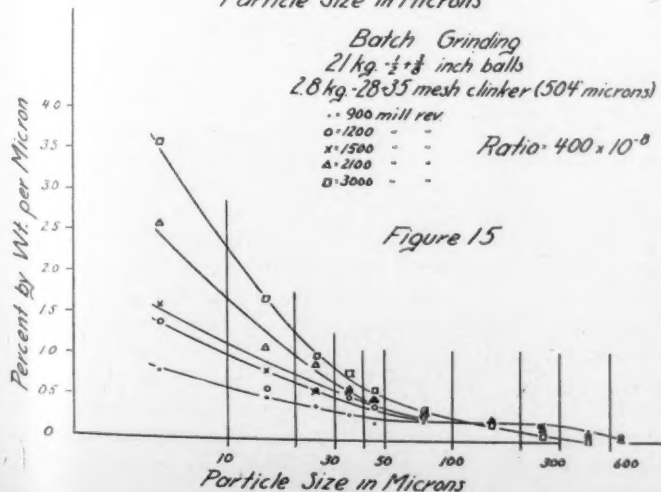
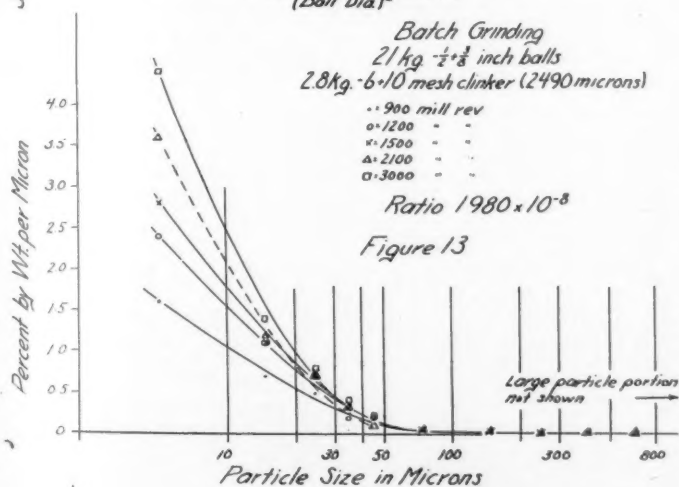
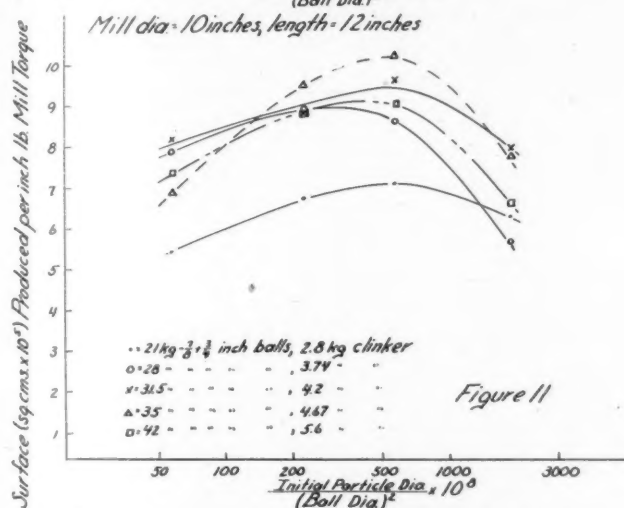
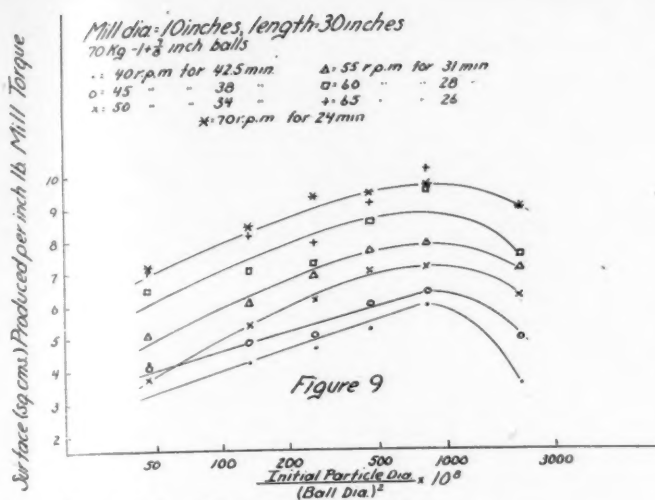
(4) The specific surface of the total product is usually highest when the optimum grinding ratio is used. (See Fig. 24 which is the same series of grinds as are shown by Fig. 23.) Comparison of Figs. 23 and 24 is striking evidence of the change that can be made in the specific surfaces of the several products by removal of the larger sizes. The statement regarding Fig. 24 is true only after an appreciable amount of grinding has taken place or after sufficient surface has been produced to make the initial specific surface of the clinker charged to the mill a small percentage of that of the product. Fig. 25 supplements Fig. 24 and is based on the same series of grinds as Fig. 7. The ordinate values of Fig. 25 are those of Fig. 7 plus the specific surface of the initial charge. For a given size of grinding ball, a small ratio grind starts with a higher specific surface than does a high ratio grind. The initial specific surface is such a large part of that of the material produced by the smallest balls ($-\frac{1}{2} + \frac{3}{8}$ in.) at the lowest ratios for which that ball was tested that the specific surface of the product of the lowest ratio grind is highest (see Fig. 25), despite the fact that this ball did most grinding at the common optimum ratio. (See Fig. 7.)

(5) Materials of equal specific surfaces produced at different grinding ratios will probably not have similar distributions of weight to particle sizes. (See Figs. 26 and 27.)

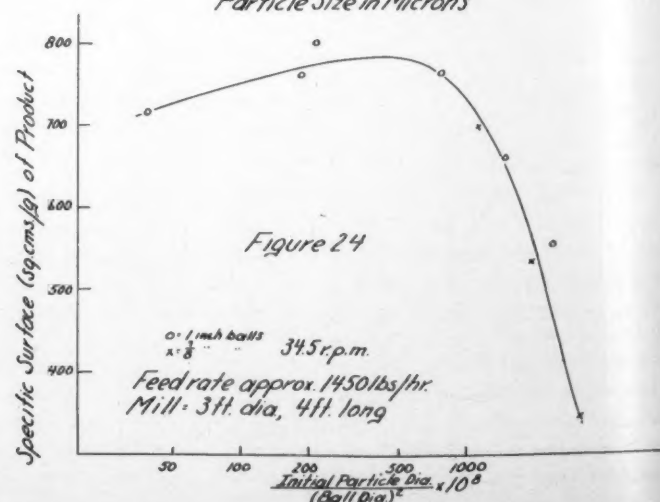
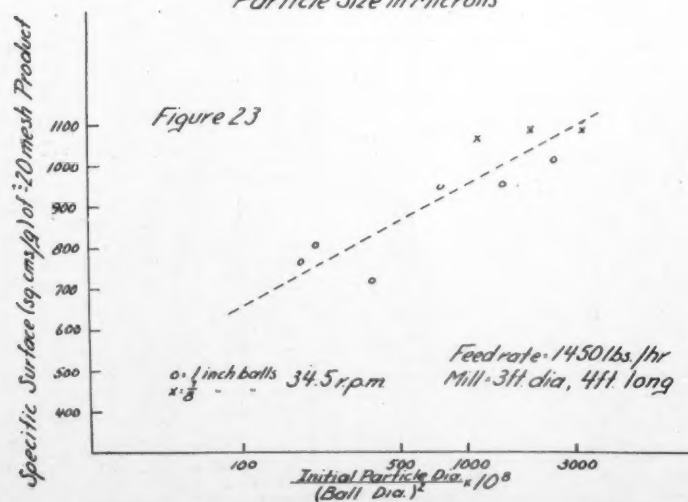
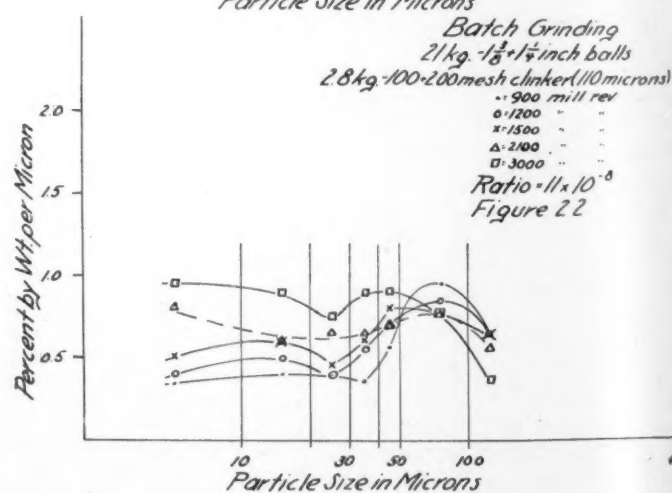
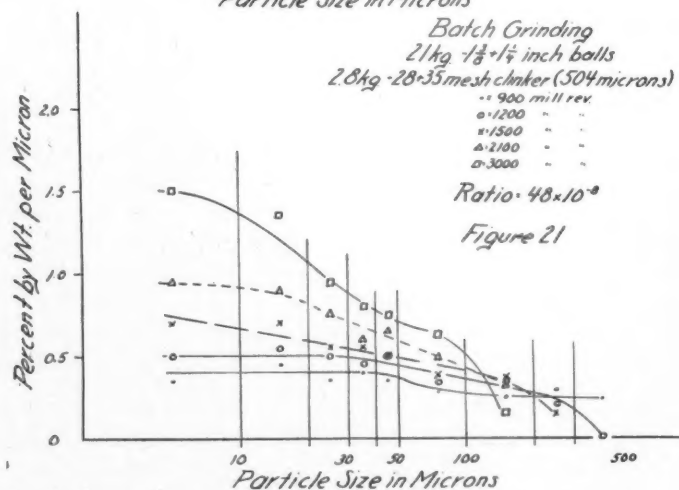
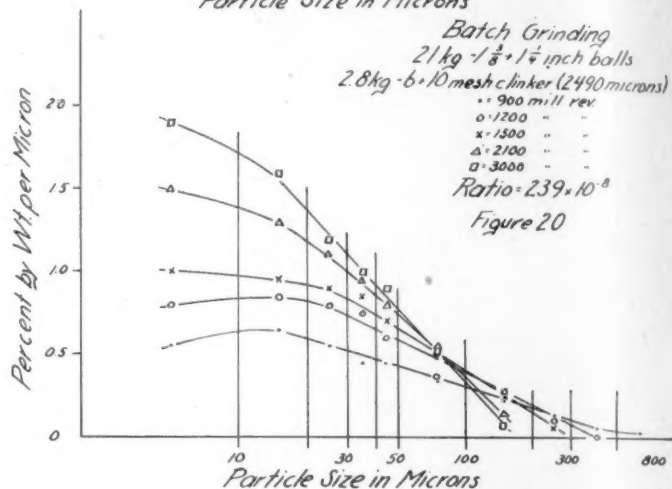
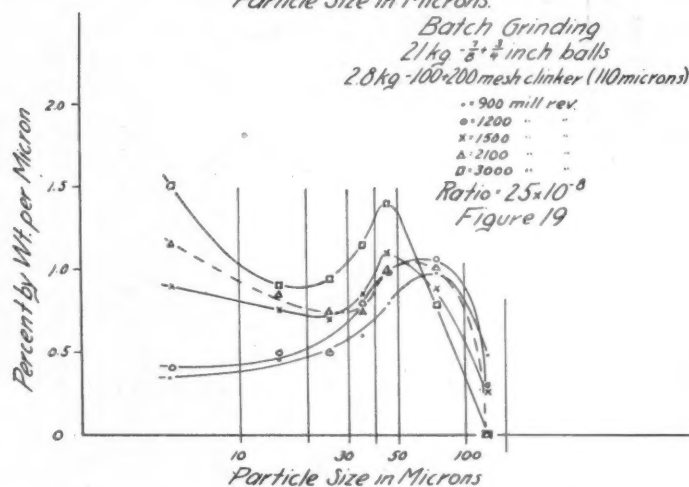
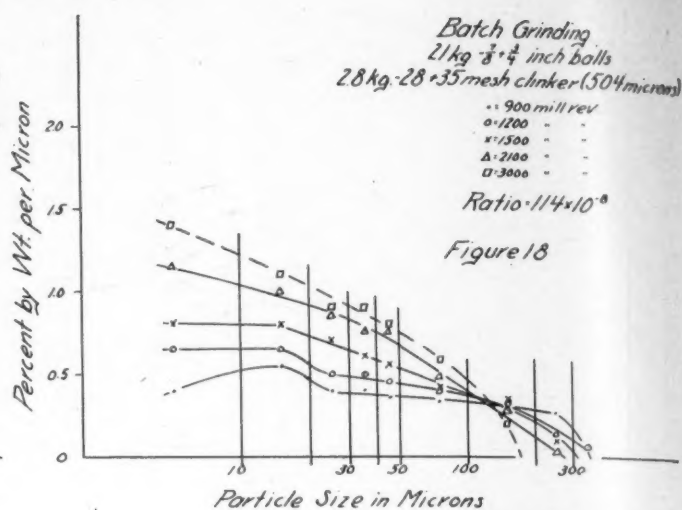
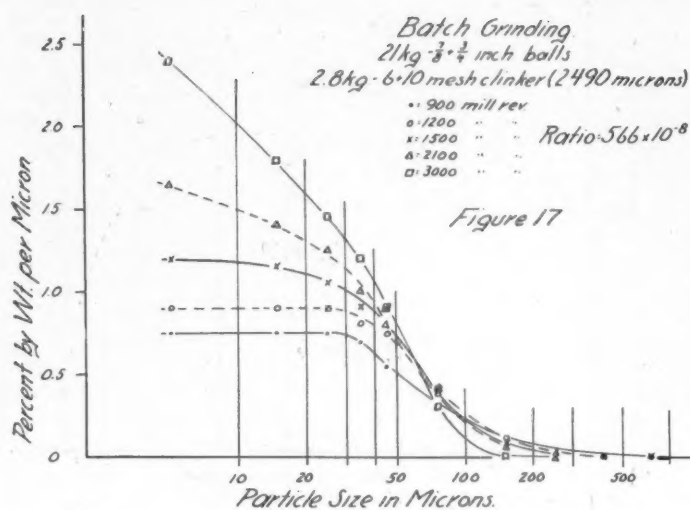
Materials ground to equal specific surfaces at equal grinding ratios will probably have similar distributions of weight to particle sizes. The products of the smaller balls at the smaller ratios are found to diverge in size distribution from those products of the larger balls at the same ratio. (See Figs. 29 and 30.) Data were not available to show a comparison at equal surface and high ratio, so Fig. 28 is presented as the best data at hand. This figure shows a comparison at the end of an equal grinding period and indicates that similarity would exist at equal specific surfaces.

General Discussion

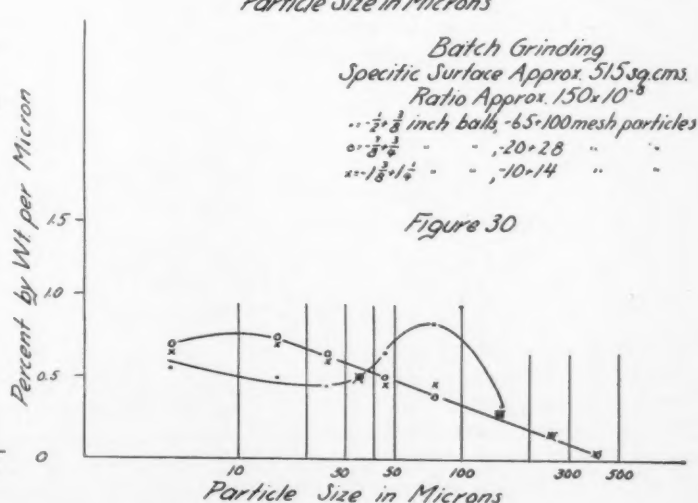
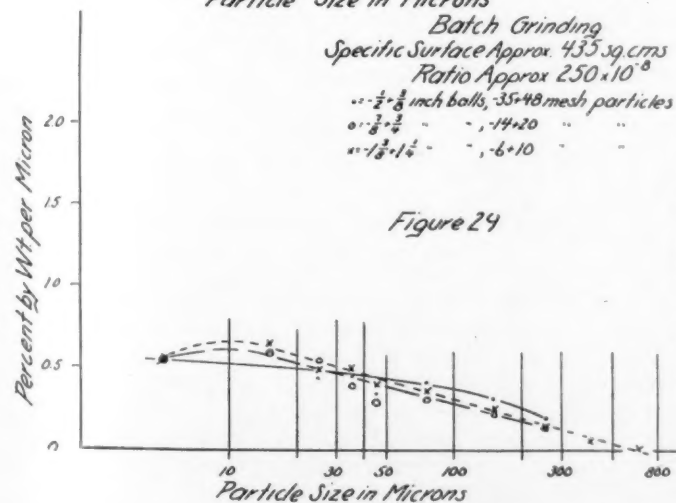
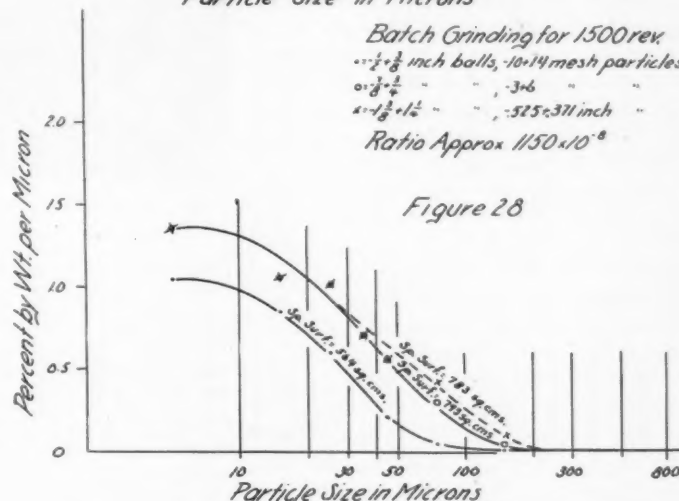
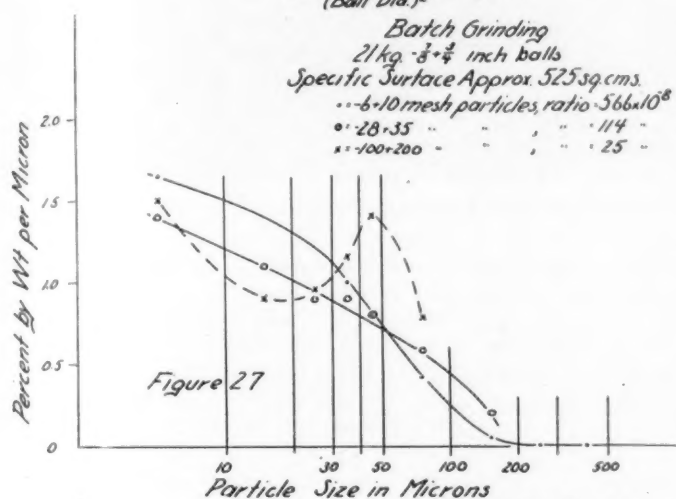
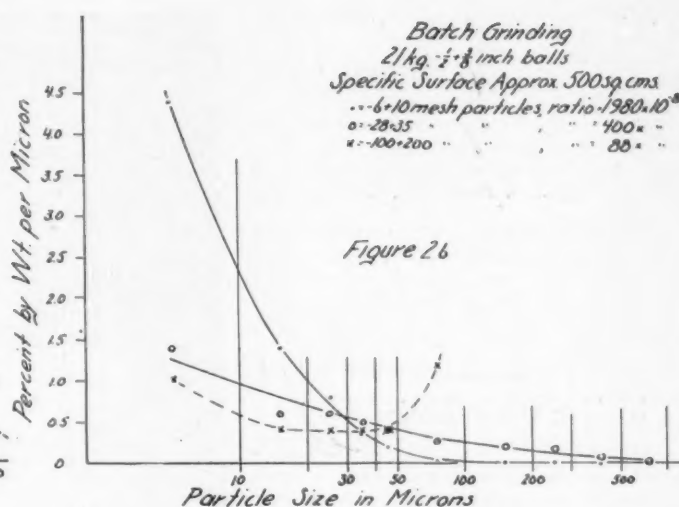
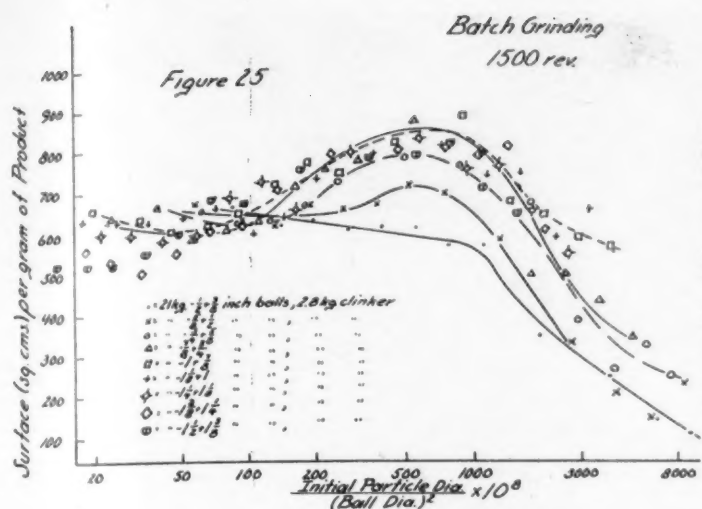
When grinding at high ratios, it is observed that the particles initially put in the mill become rounded and smoothed and few particles between one-half and one-tenth the original size are to be found in the product (see Fig. 13). This could be interpreted as indicating that reduction at high ratios was effected principally by a process of attrition



A study of grinding in ball mills and tube mills—Figs. 9 to 16, inclusive



A study of grinding in ball mills and tube mills—Figs. 17 to 24, inclusive



A study of grinding in ball mills and tube mills—Figs. 25 to 30, inclusive

The presence of appreciable weights of all possible sizes of particles (from particles of initial size to at least 8 microns) in the products of grinds at low ratios (see Figs. 16, 18, 19, 20, 21, 22) and the absence of appreciable weights of smoother particles could be interpreted as indicating that at low ratios reduction was effected principally by a process of crushing.

At the optimum ratio (Figs. 14, 15, and 17 are near the optimum), the products could be interpreted as indicating that reduction was effected by a combination of attrition

and crushing where each was active in considerable degree.

These interpretations of product size-distributions might be combined to explain the optimum ratio as that point where reduction by attrition and crushing coöperate in such proportions as to effect maximum grinding efficiency.

Conclusion

The generalizations arrived at in this paper are based on tests of laboratory and semi-commercial size mills. Commercial utilization requires the consideration of addi-

tional factors not dealt with in this paper.

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Making Better Graded Sand

Modern Sand and Gravel Co., Pacific, Mo. (owned by Stiers Bros., St. Louis), has met the demand for more scientifically graded sand as follows: The plant originally had a conventional type of sand drag for dewatering and classifying. This wasted too much good sand and did not give proper grading for state highway specification material. Then the first Charles E. Wood's "Auto-Vortex" classifier was installed. This produced a satisfactory material and the overflow was put through the sand drag and a marketable fine sand recovered.

Subsequently a second Auto-Vortex classifier was installed and the sand drag discarded. The present method of operation is as follows: The mixture of water and sand and gravel from the Meramec River is brought to the top of the screening plant by means of a scraper excavator and dumped into a hopper. There are seven screens, five revolving and two vibrating, taking out six sizings of gravel and leaving the seventh size as sand.

This discharge of sand is delivered from a trough into the first of the sand classifiers, which is placed slightly above the other and to one side, as shown in the illustration. A 10-in. pump injects water into the mixture at the rate of 900 gal. per min. This mixture hits the six vanes spaced around the circumference of the inner circle, pointing inward, and drives the classifier at a rate of approximately 600 r.p.m. The coarser material falls through holes in the bottom of this circle into a bin below.

The finer material will come to the top when the mixture is rotated and passes over the inner circle ring and falls into the area included between the next two rings. From this area the rapidly moving mixture is led by a trough to the classifier below, where the same process is used to separate the lighter material (now sticks and clay, etc.) from the sand. These undesirables are led to a chute, which leads to a pipe dumping back into the river.

The designer of the classifiers specified a water pressure to supply 900 gal. per min. at this particular plant, although this can be varied to increase the number of revolutions and give even finer classification of sand. Another ring can be inserted also, if more fines are desired. A system of weights at the bottom of the bins directly below the



Sand classifier at the Modern Sand and Gravel Co., Pacific, Mo.

classifiers is used to control the amount of fines by controlling the dumping of the coarse sand into the large bin below. The heavier the weights, the heavier will be the load in the first classifier required to open the gate below and consequently more fines will be gotten out. If these weights are very light, nearly anything which goes through will be discharged.

Two grades of sand are obtained, where only one was saved (torpedo) before the installation. For the coarser grade it is required that not less than 65% pass a 20-mesh screen and not more than 21% pass a 50-mesh screen. The plant superintendent says that there is a 98% accuracy in the sizing. The classifiers have been installed a year, but had been used elsewhere, with a total operating time of four years, and there is no sign of wear, as the material does not strike the rings.

Sand and Gravel

E. T. Slider, Inc., New Albany, Ind., is the new name for an old-time producer. Mr. Slider recently incorporated his extensive business interests. The local newspaper says: "The capital stock of the concern is 4000 shares, no par value, and the objects for which it was incorporated are to engage in the sand, gravel and coal business. The incorporators are: Edward T. Slider, Chester C. Slider, Clarence N. Slider, Walter L. Slider, Osborne G. Reilly and Charles D. Kelso. Mr. Slider, who founded the company, began his business career with his father, the late Capt. John T. Slider, for whom he drove teams. Later he was employed as a team driver for the Terstegge-Gohmann Co. In 1887 Mr. Slider engaged in business for himself, when he conducted a transfer business. Excepting for one year since he

has been in business, Mr. Slider has shown a substantial profit. For many years the name of E. T. Slider has been known from one end of the Ohio River Valley to the other. He is operating the most extensive sand and gravel business on the Ohio River and is owner of the largest towboats and fleet of barges that ply the stream. He has also been engaged in the coal business in New Albany since 1891."

◆ ◆ ◆

Northern Gravel Co., Barton, Wis., is rebuilding its screening plant, replacing its old revolving screens with vibrators. Frank Bingham is manager.

◆ ◆ ◆

Hallett Construction Co., St. Peter, Minn., opened its plant to supply highway stone, on June 1, with but a single order on the books. The plant employs 25 men and is called upon to produce an aggregate for surface-treated asphalt roads containing 5% through 100-mesh material, under new state highway specifications designed to prevent "bleeding" troubles experienced with roads treated last year.

◆ ◆ ◆

Meriwether Sand and Gravel Co., North Louisville, Ark., came near to losing its manager (A. E. Meredith), when he attempted to shoot it out with robbers who had been helping themselves to the company's gasoline, on the night of June 6.

◆ ◆ ◆

Sicily Island Sand and Gravel Co., near Jonesville, La., is building a new plant on Sicily Island, to have a capacity of 2000 tons of washed sand and gravel per day. S. E. Billman, St. Louis, Mo., is president of the company. Production is expected to begin about the middle of July. A spur connects the plant to the Missouri Pacific Ry.

Rock Products News Briefs

Prices Bid—Contracts Let

Green Bay, Wis.: Bids for year's requirements of crushed stone or gravel for highway improvement in six of the county's towns were as follows: At Allouez, gravel delivered, \$1.02 per cu. yd.; Bellevue, $\frac{3}{4}$ -in. stone, \$1.30, delivered; gravel, 42c, f. o. b. pit, and 7c per yard-mile for delivery; De Pere, $\frac{3}{4}$ -in. stone, delivered, \$1.10; gravel, delivered, 90c; Glenmore, stone, \$1.30, delivered; gravel, \$1.23; Morrison, gravel, f. o. b. pit, 40c, and 7c per yard-mile; stone, delivered, \$1.45; gravel, 88c, delivered; Holland, gravel, delivered, 73c; stone, \$1.25.

Boise, Ida.: W. C. Burns, Idaho Falls, has been awarded a contract for furnishing crushed gravel or crushed rock surfacing and cover coat material in stock piles at four different locations on highway projects for \$22,676. The state highway engineer's estimate was \$32,750, and the high bid was \$30,190—which shows Idaho producers are sharpening their pencils.

St. Anthony, Ida.: Triangle Construction Co., Boise, was the low bidder at \$17,289, for furnishing crushed gravel in windrows and stock piles, to be used in oil surfacing 22.304 miles of the Yellowstone Park highway between St. Anthony and Warm River, in Fremont County. The high bid was \$32,859, and the engineer's estimate, \$22,270.

Flemingsburg, Ky.: Through a cooperative project, in which the Agricultural Extension Service, the Rural Rehabilitation, the local relief office and local pulverizer men are all working together, Fleming County farmers for a limited time, will be able to get agricultural limestone at 82½c per ton.

Milwaukee, Wis.: The city purchasing department has begun to "chisel," according to the *Milwaukee Leader*, quoted as follows: "Low bids for the sand and gravel for construction purposes, opened May 28, were more than 15% below the quotations submitted by sand and gravel companies for a number of months. The board, several weeks ago, rejected bids by 26 companies because the offers were identical and above prices in the past. The lowest bidder May 28 offered to sell gravel for concrete work at \$1.20 a ton, compared to lowest previous bids of \$1.43 a ton. Low bids on "covering sand" were \$1.07 a ton, against \$1.36 on the prior occasions."

Ellington, Wis.: has let a contract for the season's supply of gravel to the Fulcer Gravel and Block Co., Hortonville, for 67½c per cu. yd.

Toledo, Ohio: Bids on 1000 tons of bituminous paving mixture for city street repairs were as follows: S. E. Johnson Co., \$5 a ton; Continental Bitumen Co., \$5; H. P. Streicher Co., \$5.25; Maumee Asphalt Paving Co., \$5.10, and Toledo Asphalt Cold Patch Co., \$4.72. Kentucky Rock Asphalt Co., maker of Kyrock, submitted bids of \$9.30 a ton for one kind of material and of \$11.90 for another.

Boyertown, Penn.: Boyertown Stone and Service Co., one of five bidders, was awarded contract for 2000 tons of crushed stone at \$1.25 per ton.

Bloomington, Ill.: Prothero and Willis awarded contract for 1000 cu. yd. of road gravel at 35c.

Walla Walla, Wash.: County to furnish the city minus $\frac{3}{4}$ -in. gravel for street work at 49c per cu. yd.

Memphis, Tenn.: Marquette Cement Manufacturing Co. awarded contract for 100,000 bbl. of cement for river revetment work by U. S. Army Engineers at \$2.10 per bbl., f. o. b. Cape Girardeau.

Bonneville Dam, Ore.: Pacific Portland Cement Co., San Francisco, Calif., was awarded U. S. War Department contract for furnishing 565,000 bbl. of portland cement at a bid of \$916,522, delivered at North Bonneville. A special cement will be furnished for the work, Portland, Ore., offices of the Pacific Portland Cement Co. announced. It is called portland-puzzolan cement, a type designed especially for construction of the Bonneville dam. The order, which will amount to almost 3000 carloads, will be produced at Redwood Harbor, Calif., and shipped to North Bonneville during the period of August, 1935, to November, 1936. The low bidder quoted a unit price of \$1.6198 on 560,000 bbl. and \$1.8868 on 5000 bbl. The Santa Cruz Portland Cement Co., San Francisco, with distributing plant in Portland, quoted unit prices of \$1.80 and \$2.10 for a total of \$1,018,500. The third bidder, the Beaver Portland Cement Co., Portland, with plant at Gold Hill quoted unit prices of \$1.82 and \$2.22 for a total of \$1,030,300.

Talc

Cohutta Talc Co., Chatsworth, Ga., by adding a small Williams hammer mill to take the tailings of a previously installed Grundler pulverizer, has increased its production of 300-mesh material from 5 to 6 tons per day. Hammers of the talc company's own design are used in the new mill.

Crushed Stone

Halvorson Rock Crushing Co., Lake City, Minn., has entered into an agreement with the State Rural Rehabilitation Corporation to furnish pulverized limestone as a by-product of its highway stone crushing operations at three quarries. The limestone will be delivered to farmers at \$1.20 per ton.

Missouri Limestone Products Co., Columbia, Mo., began operation late in May by shipment of a carload of pulverized limestone to Lincoln, Neb., to be used in stock feed mixtures. Agricultural limestone and chicken grits will also be produced. Lee W. Harris and Ebba R. Anderson are proprietors.

Louis Storm, Calcite, S. D., is operating a new limestone products plant, making limestone flour in a flour-type grinding mill using mill stones.

Palmer, Woolf and Gray, Winfield, La., began operations at their limestone quarry early in June, giving employment to 50 men. Jack Watts is manager.

Knoxville, Tenn., has purchased the quarry and plant of the former South Knoxville Macadam Co. for \$30,000, to be operated as a municipal enterprise.

Limestone Products Co., Menominee, Mich., and Green Bay, Wis., has established a branch at Racine, Wis., with W. K. Smith as manager. The company also deals in cement and lime.

Stevens Point, Wis., has obtained an option to buy for municipal operation the quarry of Patrick O'Connor on St. Louis Ave. The option is to run until October 1, and, in the meantime Mr. O'Connor may continue operation.

Louisville Crushed Stone Co., Louisville, Ky., is building a new plant. It will use a deposit 46 ft. thick of hard limestone, and will have a capacity of 100 tons an hour. Details will be published in a later issue of ROCK PRODUCTS.

Central Rock Co., Lexington, Ky., has recently added a stone-sand recovery plant. The minus $\frac{1}{8}$ -in. screenings are sent through two Columbus sand drags, 15 ft. centers, the fines going to a pool, where even very fine dust is recovered, clean.

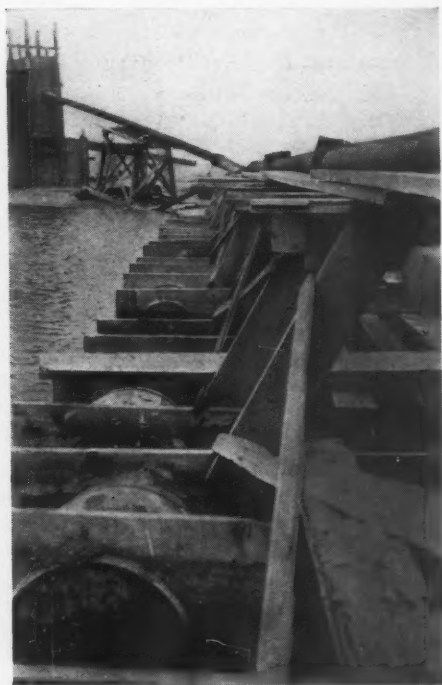
Wautaga Limestone Co., Wautaga, Tenn., has increased production of smaller sizes by adding a 6-in. Allis-Chalmers gyrating crusher to supplement an 8-in. primary gyratory. The new crusher is driven by a 50-h.p. G.-E. motor by a belt.

Hints and Helps for Superintendents



Pipe Line Pontoons

THE accompanying illustration shows how one sand and gravel producer carried his dredge pipe line ashore in such a way as to keep it well above the water. Discarded steel oil barrels are used for the floats. Stringers, with arcs cut out to fit over

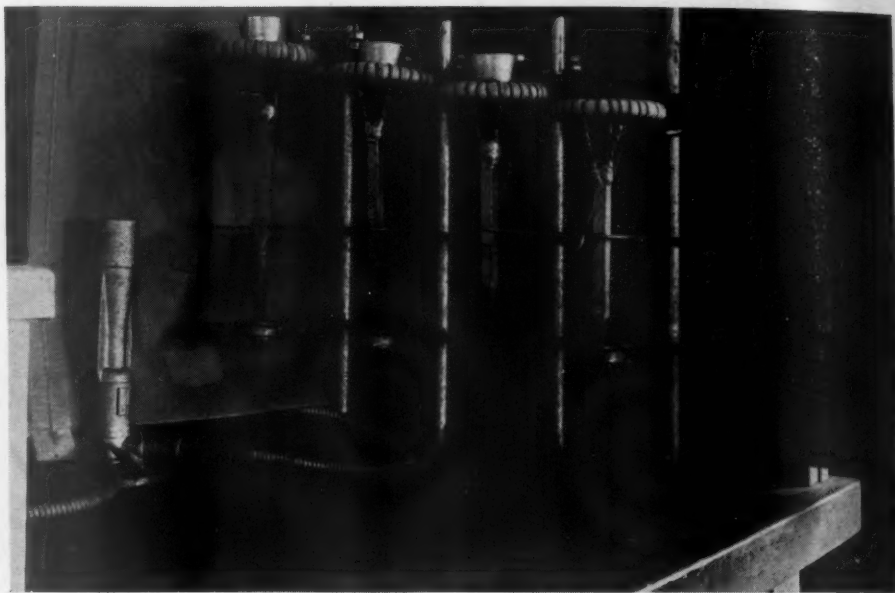


Pipe line kept out of water

the barrels, carry the superstructure. One advantage of this method of carrying the pipe line is that it provides for a walkway and makes repairs possible without a boat.

Asphalt Pavements for Quarry Trucks

THE Big Rock Stone and Material Co., Little Rock, Ark., has found it to be very economical and a very flexible operation to replace their 4-cu. yd. Western side-dump cars and locomotive by trucks for the haul from quarry to the crushing plant. Three 14-ton Hug "Roadmaster" trucks are used. An asphalt road 20 ft. wide has been built from all parts of the quarry to the crushing plant, enabling the trucks to operate in all weather conditions and to pass each other. The length of haul is 1800 ft. A Bucyrus-Erie full-swing shovel is used with a 3-yd. dipper to load these trucks. About 1200 tons are hauled each 8-hr. day. Operation of the plant has not been speeded up,



Apparatus to speed up crucible evaporations

but the number of laborers in the quarry has been cut from about 50 to 8 men at any one time. The capacity of the crusher is 2000 tons per 8-hr. day.

Saves Cement Laboratory's Working Time

By D. R. Williams,
Monolith Portland Midwest Co.
Laramie, Wyo.

THE APPARATUS shown eliminates a considerable amount of time in crucible evaporations without danger of loss.

It is made from scraps usually found in the modern cement plant laboratory. It consists of a support ring wound with asbestos tape until the center hole is about $\frac{3}{4}$ in. wider in diameter than the top of the crucibles to be used. This ring is wound with

nichrome wire (in this instance from a burned-out strip heater) and spaced about $\frac{1}{4}$ in. apart around the ring. This is connected to a rheostat so that the intensity of the heat can be varied.

The support for the crucible is a nichrome triangle with the sides bent down to form legs. These are brazed to a rod that has a leveling screw at the bottom and is fastened to the support rod independent of the ring, so that the crucible can be raised as the solution evaporates. The advantage is that the heat can be kept at the top level of the solution and thus eliminate any tendency to bump. The apparatus serves for all crucible evaporations including those for alkali determination and the hydrofluoric acid corrections for SiO_2 .

The cut shows a battery of four of these evaporators in operation.



Quarry operation speeded by paved roadway

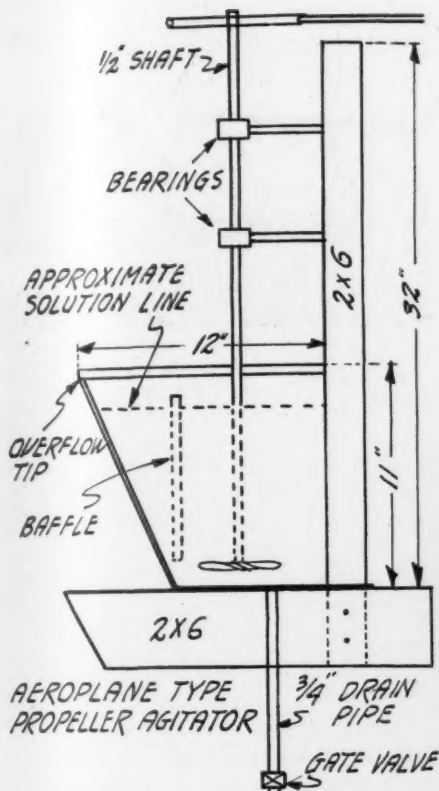


Diagram of "oil flotation" machine
Laboratory Device for Testing
Removal of Lignite in Sand

IF SAND contains lignite or bituminous coal try the following: Place 100 grams of the sand in a 2-liter bottle and add a quart of water. Add three drops of cresylic acid and one drop of coal oil (kerosene). Shake one to three minutes very violently so that a lot of air bubbles will form. Allow the sample in the bottle to come to rest and note that the coal is floating on the surface of the water. If the surface of the liquid is black it indicates that the coal is floating. If it does not float at the first attempt try adding a few more drops of cresylic acid and coal oil; in other words experiment a little and it will soon be found that a very clean separation can be made.

If a more reliable test is wanted an "oil flotation" machine can be made for laboratory purposes similar to the one shown in the illustration and sketches. The device should go at a sufficient r.p.m. so as to give a vigorous agitation, but the agitation can be overdone; but if made as indicated a r.p.m. of 300 is about correct.

Coal is one of the easiest minerals to float by the use of the oil or froth flotation process, and when one familiarizes himself with this art all but traces of the coal can be cheaply removed.

In the larger flotation plants in the United States machines are used that are continuous. They require little power and the entire cost will range from 5 to 10c per ton of material treated. In the non-ferrous metallurgical plants oil flotation is quite common practice, but the sand producer is probably not even aware of the decided advantages this process has for cleaning his sand.

Notes on laboratory flotation machine for floating lignite coal from sand:

The device is simply a water-tight container that holds about a gallon and is provided with a stirring mechanism to give a violent agitation. The sand will stay in the machine and can be drawn off at the 3/4-in. valve. The coal will float over the overflow lip. The zone in and near the overflow lip should be more or less quiet and free from agitation; if too violent slow down machine or use a smaller airplane-type propeller.

Try a 25% solid and 75% water mixture at first

Add only a few drops of the cresylic acid and coal oil. The cresylic acid is a foam producer and the coal oil is a "collector" of the coal. Most any creosote oil and coal tar oils will act similarly; also pine oils. The amount used is less than 0.5% of solids treated.

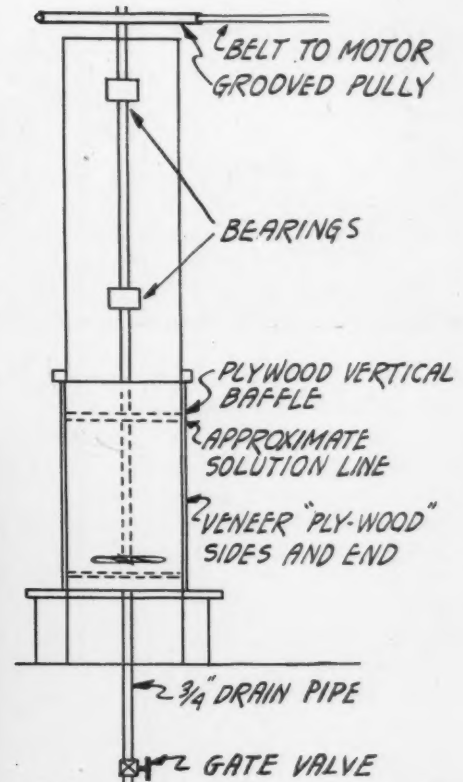


Device to remove lignite from sand

Welding Generator Detects Plugged Conduit

IN POURING CONCRETE in a large power-house recently, some conduits became plugged with cement. Since no one knew exactly where the pipes ran in the floors and walls, the problem was to locate them without digging up unnecessary parts of the flooring. By connecting the electrodes from the welding set to the ends of the pipes and using an ordinary compass, the Service Department of the Canadian Westinghouse Co. was able to draw a chalk line directly over the pipe in trouble. Then a fish tape was used to measure the distance from the ends to the plugged portion, making it possible to break out the concrete directly at the point of obstruction.

In spite of the fact that the pipes were 14 inches below the surface, half an inch or less deviation from the direct line could be detected by the compass needle.



Another sectional view of separating unit

Improvised Dust Collectors

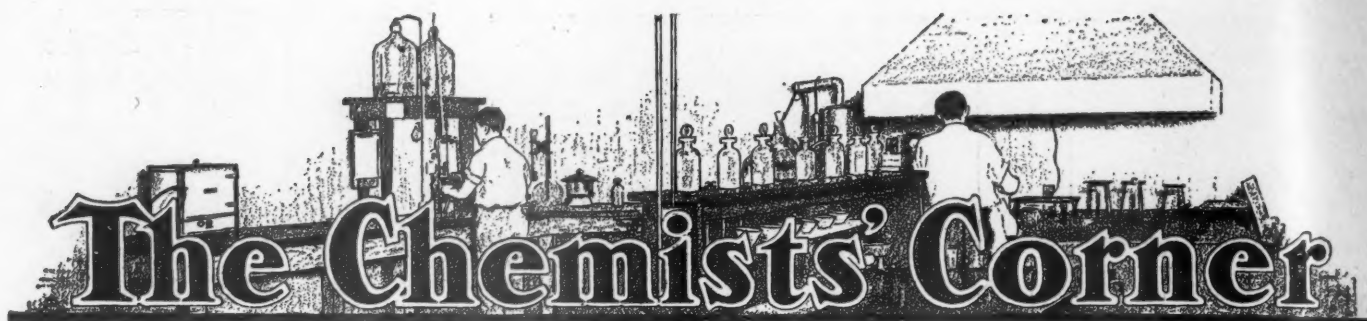
A CRUSHED STONE PLANT on the Pacific Coast is not provided with facilities to wash its stone. Hence the stone must be screened dry with considerable fine dust attending the operation.

At various places about the plant dust collecting fans have been installed to collect the fine dust and to deliver it to improvised dust collectors.

The collectors shown in the illustration were made from tanks intended for the storage of water. The two collectors operate in series and consist, in essence, of simple settling chambers with their outlets protected by a layer of burlap. Doors are provided so that the accumulated dust may be easily removed. The collector shown receives the dust via a 10-in. Buffalo Forge Co. fan.



Dust collectors made from tanks



Notes on the Testing of Fineness of Grinding of Certain Minerals

By Dr. Julius Grant, M. Sc., F. I. C.,
London, England

AN EVEN FINENESS of division is of paramount importance in most industries where finely ground minerals are used, and this is particularly the case for minerals intended as loadings and fillers, as in the paper and rubber industries and in the paint industry. Those responsible for grinding the product to a particular size can usually tell when this process has been carried far enough, but for the supply of accurately graded material, standard testing sieves are necessary.

The buyer of the products, however, is often much more exacting in his tests. He is usually interested, not only in fineness of division, but also in ease of disintegration, freedom from caking and color, cleanliness, etc., and it may happen that a product which the manufacturer thinks should meet a customer's requirements is condemned as unsuitable.

With reference to fineness of division, many of these differences of opinion arise as a result of different methods of examination by the persons concerned. The writer has in mind a sample of "pearl hardening," or precipitated calcium sulphate, which the suppliers claimed would pass a 120-mesh sieve. This was in fact demonstrated to be true by sieving in the dry state, but unfortunately the mineral was to be used in the form of a suspension in water, and in this case it was found that an appreciable residue would not pass the same sieve. This residue was composed of quite hard, glistening gritty particles, which could, however, be disintegrated by gentle rubbing and, presumably, were formed in the presence of the water.

This example emphasizes the importance of an agreement between suppliers and customers as to the method of testing to be used, and also of the choice of such a method so as to correspond more or less with the conditions of practice. All details, such as times, quantities, dimensions of apparatus and nature of the liquid, should therefore be strictly standardized in order to insure that the sample will give the same results in different laboratories.

Sedimentation Testing

A convenient method for grading particles according to size is by sedimentation, namely by noting the time they take to settle in a liquid of appropriate specific gravity. Assuming the particles are spherical and of radius R and density D , the rate of settling in a liquid of density D' is given by Stokes' equation: E (in cm. per sec.) = $2 R^2 G (D - D') / 9 N$, where G is the acceleration due to gravity (981 cm. per sec.) and N the viscosity of the liquid. In the case of sulphur in water for example, D is 2.06, D' = 1.00, and N = 0.0114 at 15 deg. C., so that a particle 1 mm. in diameter will settle at 203 cm. per sec., and at 0.000203 cm. per sec. if 0.001 mm. in diameter. In the latter case an unstable colloidal solutions results.

The method is often applied to mixtures, *e. g.*, for the separation of coarse earth from the fine clay required in the manufacture of certain kinds of porcelain. In this case the mixture is stirred well with water and the resulting sediments removed after various intervals. If the particles are all ground to the same degree of fineness, the heaviest will separate first; conversely, if they have the same densities, the largest will settle most readily.

If this method is used as a test, suitable standard conditions (suggested in connection with china clay by the Technical Association of the American Pulp and Paper Industry) are as follows:

Equal amounts of the sample are drawn from all the packages of the delivery, mixed well and quartered, and 10 grms. are placed in a 100 c.c. cylinder, and distilled water is added slowly (to avoid entrapped air) until the mark is reached. The cylinder is stoppered, the mixture is shaken well, and the volume of the clear liquid is noted after various intervals. If necessary a curve may be plotted to serve as a means of future comparisons.

A cruder method, which may, however, be considered as good as a quantitative test in the hands of an expert, is to drop a pinch of the sample into a beaker of water, when the

coarser particles drop immediately to the bottom. Differences of opinion due to the personal factor are, however, bound to arise in such cases.

Similarly if the material is lumpy (*e. g.*, china clay) a good idea of its rate of disintegration may be obtained by placing a few pieces in a beaker of water without, however, agitating the mixture. A clay which of its own accord rapidly disintegrates to a smooth cream is a good product.

Sedimentation Balance

By far the most accurate method, however, for the determination of the size and distribution of the particles in a ground product is by means of the sedimentation balance. This is an ordinary balance, one pan of which is small enough to be suspended in a settling-chamber in which is placed a suspension of 2 grms. of material in 250 c.c. of water. In cases where rapid settling occurs a smaller quantity of material must be used, or a little sodium silicate may be added as a dispersing agent.

The weight of clay which settles on the pan may then be plotted against the time required, and sedimentation curves are thus obtained which are a valuable guide to the properties of the material. In addition, the rate of settling may be used to determine the radius of the particle (from Stokes' law, above). The statistical side of this method has been developed by R. D. McCarron and B. W. Rowland in connection with the paper industry (*Paper Trade Jour., Tech. Sec.*, 1933, 96, 272).

Flotation Tests

Flotation provides another very useful test. Since this test is quite empirical, special importance is again attached to the minute standardization of conditions. A mark is made 2 in. from the bottom of a 500 c.c. beaker containing 20 grms. of sample, water is added to the mark, the whole stirred, and after exactly 1 minute the milky liquid is carefully decanted. This is repeated several times until the top liquid becomes clear

after 1 minute, and the contents of the beaker are then dried and weighed.

A rather better method is to fit up a wide-mouthed bottle (about 1 ft. high and 6 in. in diameter) with a 1/4-in. siphon tube passing through a loosely fitting hole in a rubber stopper, and also with an inlet tube, which is connected to the water tap. The bottle is filled with a mixture of the sample and water, and after a definite time the siphon is started, and the suspension is all removed except for a depth of liquid about 2 in. from the bottom. The process is repeated continuously (by filling up with water from the tap) until only clear water is drawn off, the residue being considered as "grit" and weighed. To ensure absolutely constant conditions, the bottom end of the loosely fitting siphon tube carries a float, which ensures that its end shall always be just below the surface of the water. The dimensions of the bottle and the rate of outflow, etc., may be varied according to the nature of the sample. Of course the method is not applicable to water-soluble substances such as calcium sulphate. This method is not new in principle, but the floating siphon described overcomes the difficulty of ensuring a constant pressure of water for washing purposes.

Granulometric Composition of Cement

ALTHOUGH a great deal of work has been done in other laboratories to determine the effect of fineness of grinding of cement on the properties of neat pastes, mortars, and concretes made therefrom, nevertheless there has not been enough data available to allow many broad generalizations other than that fineness of grinding is an important factor in determining the rate of increase in strength, and that there is urgent need for further study. Therefore, an investigation has been undertaken at the National Bureau of Standards with the hope of clearing up some of the controversial issues. In this study six different cements were separated into size fractions, and studies were made of the individual fractions as well as four different blends of them.

It was found in the study of the different fractions that the finest material in a cement, such as that of diameter less than 7 microns, is very valuable because of the plastic qualities which it confers upon the concrete mixes and also because of the large contribution which it makes to the early strength. Materials of sizes larger than 7 microns were found to be increasingly deficient in plasticity; a 7 to 22 micron fraction was not vastly different from an ordinary cement, while a fraction of material greater than 55 microns in diameter behaved very much like a fine sand. The strengths of mortar briquettes and concrete cylinders made from four fractions of material coarser than 7 microns were found to decrease with increasing grain size,

or to increase with increasing specific surface, at all ages tested.

Four cements blended from the fractions in varying proportions so as to have specific surfaces ranging from 1350 to 3300 cm²/g developed strengths directly related to the specific surface at all ages. The neat pastes of these cements, on the average, required an amount of water for normal consistency almost directly related to the specific surface. The time of initial set as determined by the Gillmore needle was found to be inversely related to the specific surface.

A more thorough analysis of the strength data tended to prove that the compressive strength of concrete is very nearly a direct function of the amount of cement which has become hydrous. No direct measurements of the rates of reaction were made, but a function of size distribution was found which could logically be expected to represent the amount of cement which had become hydrous and which did yield values proportional to the strengths of the fractions and also those of the blends. When the compressive strengths were plotted against specific surface, one line was obtained for the blends and another for the fractions, but when they were plotted against the supposed hydrous material, only one line was obtained.

The contribution of the 0 to 7 micron fraction to the compressive strengths of the blended cements was calculated by an algebraic method based on the assumption that the contribution of any fraction to the strength of a blended cement is equal to the product of the decimal part of the blend composed of that fraction and the strength of the fraction when tested by itself. The calculated values were of the order which might have been expected, and it is believed that they indicate the actual worth of the fine material much more closely than values determined by testing the fraction alone with the low cement-water ratio which was required by the fine material.

A complete report of the work on this problem is presented in RP777 of the *Journal of Research* for April, 1935.

Use of Lime in Salt Solution for Removing Hydrogen Sulfide from Natural Gas

THE PROBLEM of removing hydrogen sulfide from natural gas has become within the last few years one of major importance to the natural gas and petroleum industry. Hydrogen sulfide is probably the most toxic gas associated with natural gas, and from the standpoint of health and safety it is important that it be removed if the gas is to be used for domestic purposes. Hydrogen sulfide is under certain conditions an active corrosive agent and very destructive to equipment. The annual loss caused by its corrosive action on equipment amounts to hundreds of thousands of dollars.

The largest percentage of natural gas pro-

duced in the United States comes from wells which also produce oil. This associated gas invariably carries with it light fractions of petroleum, which when separated from the gas condense to the liquid form at ordinary temperatures and pressures. Commercial application is made of this natural condition, and "wet gas" is processed to obtain natural gasoline by employing the principles of absorption, adsorption, or compression and subsequent expansion accompanied by cooling. If hydrogen sulfide is not first removed, some of it may oxidize to form free sulfur and water. The free sulfur will dissolve in the gasoline and cause the product to be unsuitable for commercial use.

O. H. Schoenwald and G. M. Ford of the Wentz Oil Co., Ponca City, Okla., working in coöperation with refinery engineers of the U. S. Bureau of Mines, have developed a method of removing hydrogen sulfide from natural gas, based on the reaction of hydrogen sulfide with lime. This report has been published as U. S. Bureau of Mines Report of Investigations 3178. Treatment of the gas to remove the hydrogen sulfide was accomplished by scrubbing the gas with a solution of sodium chloride and calcium hydroxide. The salt solution appreciably increases the solubility of lime in water up to a certain percentage, and thus a smaller gallonage is required to remove a small amount of hydrogen sulfide. The treating plant consisted essentially of a scrubbing device for contacting the gas with the solution and a series of tanks for making up or settling the treating solution. The removal of hydrogen sulfide from natural gas before the gasoline was extracted had a beneficial effect on the chemical treatment required for the extracted gasoline before it could be marketed.

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Publications Received

Pneumonokonioses (Silicosis); by George G. Davis, associate clinical professor of surgery of the Rush Medical College, University of Chicago; Ella M. Salmonsens, medical reference librarian of the John Crerar library, Chicago; Joseph L. Earlywine, attorney-at-law, published by Industrial Medicine, 844 Rush St., Chicago, Ill. This volume, which is Vol. I of a series, is concerned with bibliography and laws in regard to silicosis, and is designed as a reference book for the permanent convenience of physicians, surgeons, lawyers, industrial executives, librarians, journalists, engineers, trade association officials, students and research workers. References have been gathered from the literature of the world, beginning with Agricola's "De re metallica," in 1566, and ending with the last published reference in 1933. Some time in 1935 it is expected that Vol. II will be issued, in which all of the 1934 references from the world literature will be added, in addition to a more comprehensive analysis in the law section.

Recent Dividends Announced

Alpha Portland Cement, com.	.25	July 25, 1935
Arundel Corp., com. (quar.)	.25	July 1, 1935
Coronet Phosphate	1.50	July 1, 1935
Ideal Cement, com. (quar. and extra)	.50	July 1, 1935
Kelley Island Lime & Transport Co., (quar.)	.15	July 1, 1935
Northwestern States P. C. Co.	.40	July 1, 1935
Northwestern States P. C. Co. (liquidating dividend)	1.00	July 1, 1935
Penn.-Glass Sand Corp., pfd. (quar.)	1.75	July 1, 1935
Penn.-Glass Sand Corp., pfd. (accum.)	1.75	Aug. 1, 1935
Southwestern P. C., com. (quar.)	1.00	July 1, 1935
Southwestern P. C., pfd. (quar.)	2.00	July 1, 1935
Superior Portland Cement, A.	.27½	July 1, 1935
Minn. Mining & Mfg. Co., com. (quar.)	.15	July 3, 1935
Minn. Mining & Mfg. Co. com. (extra)	.02½	July 3, 1935

National Gypsum Co., Buffalo, N. Y.: Stockholders at recent special meeting approved plan to pay up arrearage on the preferred stock and voted an increase of 100,000 shares in the authorized class A common stock. The distribution on the preferred will be one share of new \$20 per 5% preferred stock and \$1.50 a share in cash to holders of each share of the present 7% (par \$100) preferred stock on which the arrearage amounts to \$21.50 a share. To that portion of the present preferred entitled to only \$16.25 a share as arrears will be issued three-fourths of a share of new 5% preferred and \$1.25 in cash. A total of 26,000 shares of the new preferred stock was authorized. Melvin H. Baker, president of the company said that "settlement of these dividends will leave the management free to benefit from future opportunities for the company when use of additional cash in plants and working capital may be required."

Kelley Island Lime and Transport Co., Cleveland, Ohio, reports for the years ended December 31:

	1934	1933
Operating income	\$511,129	\$325,717
Depreciation and depletion	122,491	109,844
Operating profit	388,638	215,873
Selling, general, etc., expense	206,815	189,279
Net operating profit	181,823	26,594
Other income (net)	52,750	44,976
Net income	234,573	71,570
Extraordinary charge		300,000
Net profit	234,573	(d)228,430
Dividends	185,371	
Surplus for year	49,202	(d)228,430
Earned per share	\$0.76	(d)\$0.74

Notes: (1) Investments in subsidiary companies are stated in balance sheet at cost, which was slightly less than the book values thereof at Dec. 31, 1933. Operations of such subsidiaries for 1933 resulted in net loss applicable to interest of parent company of \$16,877, for which no provision has been made in foregoing statement of income and expense. (2) Net operating loss of unconsolidated subsidiaries applicable to parent company's investment, \$21,264 for year ended Dec. 31, 1934, is not provided for in 1934 statement.

Balance sheet as of December 31, 1934, showed current assets of \$1,531,471 and

current liabilities of \$138,569; cash was \$462,586 and U. S. Government securities (at cost), \$430,603.

In his annual report to stockholders, President G. J. Whelan made the following interesting observations on the status of industry generally:

The long period of the depression has made the general public and public officials conscious that business is divided into three principal groups—consumer goods, durable goods, and services. Industries in the consumer goods group, supplying food, clothing and other products that are consumed immediately or within short periods after being purchased, have been affected only slightly during the depression compared with those in the durable goods group. Services, such as transportation, utilities, etc., have felt the effects of the low level at which the durable goods industries have been operating. Your company is in the durable group, supplying materials which enter either directly or indirectly into products, structures, etc., that are of a durable nature and increase the material wealth of the country, and it has become generally recognized that the return of prosperity is dependent upon the resumption of greater activity in the durable goods industries, and the government is moving towards that objective. The long continued postponement of expenditures for durable goods is building up a huge potential demand which must some day be supplied and your company has been kept in a strong position to participate in that demand when it comes. The illustration appearing in this report shows improvements at our White Rock plant, made during the depression, and is an example of what is being done to keep our plants modern to meet future demands. Included in this illustration is our rotary kiln plant, rebuilt for the purpose of producing refractory burned dolomite, a product used in the steel industry. While your company was among the first to manufacture this product during the war, its production was discontinued for many years on account of the heavy demand for finishing lime which taxed our production capacity in the years immediately following the war.

The National Industrial Recovery Act, which became a law in June, 1933, was a necessity brought about by practices that had been growing for many years. Much good has come from it since it abruptly halted the rapid decline in prices and wages. With the minimum rates of pay provided in industry codes, it becomes necessary to maintain prices at levels that will permit the payment of wages on an American standard. There has been much strife between managements and labor, and regardless of the merits in each instance we believe future progress towards the solution of the problem must be built on a sound foundation with each side recognizing the difficulties which the other side has to face. During 1934 our pay rolls increased more than \$200,000 over 1933, over 95% of which went into the pay envelopes of the wage earners. It is safe to say that without the background of the Recovery Act, our employees could not have received this increased amount, because unrestrained competitive conditions would have made such increased payments impossible, and it is unthinkable that those in power will permit the return of those conditions that prevailed before the Recovery Act was passed.

Pacific Coast Aggregates, Inc., San Francisco, Calif., reports consolidated income for the year ending December 31, 1934:

Sales	\$1,667,582
Cost of sales	1,303,435
Selling, general and administrative expense	170,600
Depletion	15,754
Depreciation	*364,706
Operating loss	186,913
Other income (net)	17,686
Net loss	169,227
Earned per share	(d)\$0.31

*On basis established prior to effective date of reorganization, Dec. 31, 1934. It is estimated that subsequent accounting with respect to depreciation (upon basis established pursuant to plan of reorganization) will reflect an annual charge of approximately \$142,000.

Balance sheet as of December 31, 1934, showed current assets of \$628,337 and current liabilities of \$183,634. Total assets were \$6,240,490.

Marblehead Lime Co., Chicago, Ill., reports a net income of \$8669 for the year ended November 30, 1934, as compared with a deficit of \$15,170 for the previous year.

Yosemite Portland Cement Corp., Merced, Calif., reports for the years ended December 31, 1934 and 1933 comparative income accounts as follows:

	1934	1933
Sales	\$464,462	\$432,852
Cost of sales	413,630	
Administration and selling expenses	103,372	496,186
Operating loss	52,540	63,334
Other income (net)	18,460	22,136
Net loss	34,080	41,198
Profit and loss charges		28,971
Deficit for year	34,080	70,169

Current assets as of December 31, 1934, were \$433,604, of which \$167,399 was cash, and current liabilities were \$27,407. Sales expressed in dollars increased 7.3% in 1934, sales in barrels increased 21%. A. Emory Wishon, president, in his report to stockholders says: "This variance is primarily accounted for by a drastic cut in prices, initiated by competitors, over a period of two months in the late spring, which resulted in a decline in the average selling price per barrel, for 1934, of approximately 10%. Through economies effected in administrative and selling expenses we were enabled to offset increased production expenses, caused by compliance with NRA codes, of approximately \$10,000."

United States Gypsum Co., Chicago, Ill., on March 15 owned 59,409 shares of its common stock and 9055 preferred shares. The company purchased 700 shares of its own common stock in the open market between January 1 and March 15, 1935.

State Washed Sand and Gravel Co., Milwaukee, Wis., has had its charter amended to decrease its capitalization by abolishing its entire preferred stock issue; reduce class A common from 3000 shares, par value \$10 each, to 300 shares, par value \$5 each; reduce class B from 11,700 shares, par value \$10 each, to 11,700 shares, par value \$1 each.

TRAFFIC and TRANSPORTATION

Proposed Rate Changes

THE FOLLOWING are the latest proposed changes in freight rates up to and including the week of June 22:

New England

35876. **Stone**, dust, ground or powdered, Westfield, Mass., to Portland, Me. Proposed, \$2.40 per net ton.

36087. **Ground feldspar**, Cold River and Keene, N. H.

Groups 1 and 2 (New York and Brooklyn deliveries). Proposed, 19c. To Group 3 (New York lighterage deliveries). Proposed, 20c.

35963. **Talc**, testing not less than 99% through 200 mesh screen, C. L., minimum weight 80,000 lb., from Johnson, Vt., to Boston, Mass., for export or when destined to Pacific coast ports moving via boat lines through Panama Canal. Proposed, 15c.

Trunk

Sup. 1 to 33532. **Lime**, C. L., minimum weight 30,000 lb., and **pulverized limestone**, C. L., minimum weight 50,000 lb., from Chester Valley Group, Knickerbocker, Howellville, Rambo, Plymouth Meeting, Blue Bell, Devault, Swedesford Road, Penn., Billmyer Group, Union Stone Co., Bainbridge, Billmyer, Rheems, Penn., Bellefonte Group, Bellefonte, Pleasant Gap, Chemical (B. C. R. R.), Penn., and York Group, York stations, Campbell and Hellam, Penn., to Cornwall, Ont., 29c per 100 lb.

Sup. 1 to 33572. **Crude fluxing limestone**, C. L. (See Note 2), from York-Thomasville-Bittinger to Weatherly, Penn., \$1.76 per gross ton, subject to emergency charge.

33629. **Crushed stone**, C. L. (See Note 2), from Blakeslee, N. Y., to stations on the N. Y. O. & W. Ry., Walton, New Berlin Jct., North Bay, West Monroe, Fulton, Oswego, N. Y., and various, rates ranging from 90c to \$1.40 per net ton, subject to emergency charge.

33635. **A—Stone**, broken or crushed, in carloads; **B—crushed stone**, coated with oil, tar or asphaltum, in carloads (See Note 2), from Plattsburg, N. Y., A—\$1.00, and B—\$1.10 per net ton, and to Altoona and Ellenburg, N. Y., A—\$1.10, and B—\$1.20 per net ton, subject to emergency charge.

33641. **Group A—Stone**, broken or crushed, C. L.; **Group B—stone**, crushed, coated with oil, tar or asphaltum, C. L. Note: The oil, tar and/or asphaltum not to exceed 10% by weight of the commodity as shipped, the shipper to so certify on shipping orders and bills of lading (See Note 2), from Jamesville, N. Y., to New York Central R. R., Catskill Mountain Branch stations, Group A rates ranging from \$1.75 to \$2.15 per net ton and Group B rates ranging from \$1.85 to \$2.25 per net ton, subject to emergency charge.

33644. **Sand**, except blast, core, engine, fire, foundry, glass, moulding, quartz, siliceous or silica, and **gravel**, in straight or mixed carloads (See Note 2), from Pittsburgh and New Kensington, Penn., to Clymer, Penn., \$1.40 per net ton, subject to emergency charge.

33652. **Sand and gravel** (other than ground or pulverized) or naturally bonded moulding sand, in open top cars, not covered with tarpaulin; sand and gravel (other than ground or pulverized), in closed cars; sand, naturally bonded, moulding, in open cars (See Note 2), from Flanders, N. J., to stations on B. & M. R. R. taking Boston and Windsor rate bases, Mass., published in C. R. R. of N. J. I. C. C. G-4695, 18½c per 100 lb., subject to emergency charge.

33653. **Roofing granules**, C. L., minimum weight 60,000 lb., from Cockeysville, Md., Texas, Md., Watonsontown, Penn., Advance, Penn., Gladhill, Penn., Cardiff, Md., Delta, Penn., Slate Hill, Penn., and Whiteford, Md., to Stratford, Conn., \$3.70 per net ton, subject to emergency charge.

33669. **Crushed stone**, C. L. (See Note 2), from Frederick, Security, Md., Engle, W. Va., Grove, Md., Martinsburg, Millville, W. Va., Stephens City, Strasburg Jct., Strasburg, Va., Canoe Creek Stone Co., Wurtz, Basalt Trap Rock Co., Tyrone Forge, Stover,

Barre, Union Furnace, Ashrom, Penn., Cave-town, Williamsport, Md., Waynesboro, Thomasville, Bittinger, York, Penn., Ackerman, W. Va., and Baltimore, Md., to C. & P. R. R. stations, rates ranging from 80c to \$1.70 per net ton, and from Frederick, Md., Martinsburg, W. Va., Grove, Md., Engle, Millville, W. Va., Stephens City, Strasburg and Strasburg Jct., Va., to W. Md. Ry. stations, rates ranging from 80c to \$1.90 per net ton, subject to emergency charge.

33670. **Limestone**, ground or pulverized, C. L., minimum weight 60,000 lb., from Bellefonte, Pleasant Gap and Chemical, Penn., to Ligonier Valley R. R., Latrobe, Penn., to Ft. Palmer, Penn., \$1.85 per net ton, subject to emergency charge.

33691. To cancel commodity rates on **crude silica**, carload minimum weight 50,000 lb., from Lynchburg, Va., to Baltimore, Md., Bethlehem, Penn., New York, N. Y., Philadelphia, Penn., and Pittsburgh, Penn., as published in Item No. 6930 of N. & W. Ry. Tariff I. C. C. No. 8681. Class rates to apply in the future.

33695. **Feldspar**, C. L. (See Note 2), from Bedford Hills, N. Y., to Bridgeton, N. J., 16c per 100 lb., subject to emergency charge. Present rate, 22½c per 100 lb.

33696. **Stone**, natural (other than bituminous asphalt rock), crushed, coated with oil, tar or asphaltum, C. L. (See Note 2), the oil, tar and/or asphaltum not to exceed 10% by weight of the commodity as shipped, shipper to so certify on bills of lading and shipping orders, from Mill Hall, Penn., to Sterling Run, Penn., \$1.28 per net ton, subject to emergency charge.

33704. **Crushed stone**, C. L. (See Note 2), to Alexandria, Va., from Grove, Frederick, Md., Engle, Millville, Martinsburg, W. Va., and Security, Md., \$1.15 per net ton, subject to emergency charge.

33709. **Sand**, C. L. (See Note 2), from Phillipsburg, N. J., to Phillipsburg Jct., N. J. (Junction C. R. R. of N. J., D. L. & W. and L. V. R. R.), \$13.05 per car (applicable only on nonroad haul traffic), subject to emergency charge.

33730. **Crushed stone**, C. L. (See Note 2), from Oriskany Falls, N. Y., to D. & H. R. R. stations, Binghamton, N. Y., \$1.20, Port Crane, Sanitaria Springs, Tunnel, Harpursville, Nineveh, Afton, Bainbridge, Unadilla, Wells Bridge, Otego, Oneonta, N. Y., \$1.11 per net ton, subject to emergency charge.

33736. Cancel all rates named in B. & O. R. R. I. C. C. 21102 on **sand** (other than blast, engine, foundry, glass, moulding, ground from silica or pebble rock, silica and loam), C. L., and **crushed stone and screenings**, C. L., from Littleton, W. Va., to stations on the Baltimore & Ohio Railroad Co. as named in the tariff. Class rates to apply.

33738. **Limestone**, crude, fluxing, foundry and furnace, in open top equipment, C. L. (See Note 2), from Capon Road, Strasburg Jct., Va., and Grove, Md., to various points in Pennsylvania, Maryland, West Virginia and Ohio, rates ranging from 83c to \$2.39 per gross ton, and from Martinsburg, W. Va., to Gibsonton, Massena, Penn., \$1.05, and Pittsburgh, Penn., \$1.16 per gross ton, subject to emergency charge.

33739. **Limestone**, ground or pulverized, C. L., minimum weight 60,000 lb., from Rochester, N. Y., to various points on the N. Y. C. R. R. in New York state and Pennsylvania, rates ranging from 65c to \$1.65 per net ton, subject to emergency charge.

M-3409. To cancel all destination ground storage arrangements on **stone, marble and granite** at all points in trunk line territory. Cancellation will not apply to the ground storage in transit arrangements now effective on the Jersey shore or Manhattan Island for furtherance to New York Harbor deliveries.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Central

43073. To establish on **stone**, fluxing, furnace or foundry, melting and/or refractory (unburned), in bulk, C. L., from Ridgeville, Ind., to Streator and Alton, Ill., \$2.10 and \$2.40 per gross ton.

43074. To establish on **common sand and gravel**, in open top cars, C. L., from Lafayette and Kern, Ind., to St. John, Ind., 52c per net ton.

43150. To establish on **stone**, fluxing, furnace or foundry, melting and/or refractory (unburned), in bulk, C. L., from Ridgeville, Ind., to Lapel, Ind., 120c per net ton. Emergency charge in addition to proposed rate. Route—Via P. R. R., Anderson, Ind., C. I. Ry.

43183. To establish on **sand**, except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding and silica, and **gravel**, **crushed stone** and **stone screenings**, C. L., from Kenneth, Ind., to Winamac, 50c, and Bruce Lake, Ind., 55c per net ton.

43216. To revise minimum weight applicable in connection with rates on **stone or rock gaster**, ground, published in Item 955 of C. F. A. L. Tariff 100AA, from Chicago, Ill., to Indianapolis, Ind., Cincinnati, O., Evansville, Jeffersonville, Madison, New Albany, Ind., Louisville, Owensboro and Henderson, Ky., to read as follows: Proposed minimum weight 80,000 lb. On shipments originating at points on the I. C. R. R. (See Note 1).

43233. To establish on **sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding or silica) or **gravel**, C. L., from Mantua, O., to Westview, O., 85c per net ton.

43250. To establish on **crushed commercial slag** (product of iron or steel blast or open-hearth furnaces (not including granulated slag), in open top cars, C. L., minimum weight 80% of marked capacity of car, from Massillon, O., to Mishler and Minerva Jct., O., 50c per net ton.

43252. To establish on **sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding or silica) or **gravel**, C. L., from Burbank, O., to Ashland, O., 50c per net ton.

43292. To establish on **sand** (other than blast, core, engine, filter, fire, furnace, foundry, glass, grinding, polishing loam, moulding or silica) and **gravel**, in open top cars, C. L., from Benwood and Wheeling, W. Va., to Dover, O., 95; Justus, O., 100; Midvale, O., 90; Uhrichsville, O., 90, being proposed rates in cents per net ton.

43294. To establish on **slag**, commercial crushed (a product of iron and steel blast and open hearth furnaces), in open top cars, C. L., from Massillon, O., to Lester, 60c, and to Valley City, O., 80c per net ton. Route: Via B. & O. R. R. direct.

43297. To establish on **sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding or silica) and **gravel**, in open top cars, C. L., actual weight will apply, from Massillon, O., to Homer, O., 80; Nova, O., 85; Hereford, O., 85; Boughtonville, O., 95; Willard, O., 95; Lester, O., 60; Valley City, O., 80; Erhart, O., 80; Mineral City, O., 50; Valley Jct., O., 50, being proposed rates in cents per net ton. Route: Via B. & O. R. R. direct.

43304. To establish on **crushed stone and agricultural limestone** (unburned), C. L., in open top cars, from Cold Springs, O., to following Ohio points (rates in cents per net ton): Emery Chapel, 70; Oakview, 70; Yellow Springs, 70; Goes, 70; Spring Valley, 75; Roxana, 75; Waynesville, 80; Oregonia, 85; Morrow, 85; Middletown Jct., 85; Kings Mills, 85; Fosters, 90; Loveland, 90; Miami, 95; Milford, 95; Mason, 85; Brecon, 90; Blue Ash, 90; Terrace Park, 95; Plainville, 95; Clare, 95; Oakland, 85; Union Village, 85; Glenwood, 85; Hageman, 85; Shaker Crossings, 70; Rosslyn, 70; Lambeth, 70; Schroyers, 70; Pasadena, 70; Hempstead, 70; Centerville, 75; Lytle, 75; Kitchener, 80; Dodds, 80; Lebanon, 85. Route: Via C. C. & St. L. Ry., Springfield or Dayton, O., thence P. R. R.

43310. To establish on **limestone**, agricultural, unburnt, from Gibsonburg and Woodville, O., to points in Indiana, rates as shown:

To	Proposed—		
P. R. R.	*(A)	†(A)	(B)
Monroeville, Ind.	190	140	126
Ft. Wayne, Ind.	190	140	126
La Otto, Ind.	190	140	126
Wolcottville, Ind.	190	140	126
Howe, Ind.	190	145	130
Warsaw, Ind.	200	150	135
Plymouth, Ind.	200	155	139
Hamlet, Ind.	200	160	144
Valparaiso, Ind.	230	165	148
Liverpool, Ind.	230	170	153
South Bend, Ind.	200	155	139

C. C. C. & St. L. Ry.			
Granger, Ind.	200	155	139
Elkhart, Ind.	200	150	135
Milford, Ind.	200	150	135
G. T. Ry.			
Mishawaka, Ind.	200	155	139
Granger, Ind.	200	155	139
M. C. R. R.			
Valley Creek, Ind.	230	165	148
Porter, Ind.	230	165	148
Michigan City, Ind.	230	165	148
P. M. R. R.			
Wellsboro, Ind.	230	160	144
Magee, Ind.	230	160	144
La Porte, Ind.	230	160	144

*Minimum weight 50,000 lb.

†Minimum weight 60,000 lb.

(A) Limestone, agricultural, unburnt, in bags or in bulk in box cars.

(B) Limestone, agricultural, in bulk, in open top cars.

(See Note 3.)

43316. To establish on **crushed commercial slag** (product of iron or steel blast or open hearth furnaces) (not including granulated slag), in open top cars, C. L., minimum weight 80% of marked capacity of car, from Canton, O., to Eldon, O., 100c per net ton. Route: Via W. & L. E. Ry., Zanesville, O., B. & O. R. R.

43322. To establish on **feldspar**, C. L., minimum weight 50,000 lb., from East Liverpool, O., to Niagara Falls, Ont., 360c per net ton, emergency charge applicable to be additional. Routes: As provided in P. R. R. Tariff I. C. C. 1410.

43346. To establish on **sand** (except blast, core, engine, filter, fire and furnace, foundry, glass, grinding or polishing, loam, moulding or silica) and **gravel**, in open top cars, C. L., from Hugo, O., to Westview, O., 80c per net ton.

Southern

Amdt. 1 to 8301. **Phosphate rock** (other than ground rock, slush and floats and soft phosphate), C. L., Inverness, Floral City and Lacombe, Fla., to Tampa and Port Tampa, Fla., for export or coastwise movement. Submittal is hereby amended to provide for Lacombe, Fla., as point of origin at the same rate as suggested from Inverness and Floral City, Fla.

8414. Grinding in transit privileges at Cartersville, Ga., on **stone, broken, fluxing, rubble and/or stone screenings** (N. C. & St. L. Ry.). The N. C. & St. L. Ry. formerly provided in its I. C. C. 3084-A grinding in transit privileges at Cartersville, Ga., from Sparta, Tenn. It is proposed to amend N. C. & St. L. Ry.'s Miscellaneous Charges, Rules and Regulations Tariff No. 6, I. C. C. 3307-A, and reestablish the provisions formerly in effect, except that the emergency charge authorized under Ex Parte 115 will be in addition.

8435. **Phosphatic sand or clay** (fertilizer filler), ground or not ground, C. L., Brewster, Fla., to Shreveport, La. It is proposed to cancel the present rate of 480c per net ton, C. L. (See Note 2), from Brewster, Fla., to Shreveport, La., the ground phosphate rock of 600c per ton of 2240 lb. to apply after cancellation.

8488. It is proposed to establish a complete line of rates on **crushed stone**, C. L. (See Note 3), but in no case shall minimum weight be less than 90,000 lb., from N. & W. Ry. stations, Alco, Blue Ridge, Buchanan, Emil, Kerns, Marion, Miles, Pembroke, Ripplemead, Roanoke and Schuless, Va., to D. & W. Ry. stations, Stuart to Whitfield, Va., inc., also Leaksville Branch stations, predicated upon the Docket 17517 joint line scale. Rates from Klotz, Va., which is located on the Virginia Ry., are being included on the same basis, and Pembroke, Va. (Virginia Ry.) is included with Klotz, Va., rates to apply.

8488 (Amdt. 1). **Stone, crushed**, C. L., from N. & W. Ry., Virginia Ry. and C. & O. Ry. quarries in Virginia to Danville and Western Ry. stations (Stuart, Va., to Whitfield, Va., inclusive, and Leaksville branch stations). Amended to include as origin points C. & O. Ry. quarries located at Rocky Point, Indian Rock and Eagle Mountain, Va. Rates from these points also to be predicated upon the Docket 17517 joint line scale.

8622. To establish rate of \$1.70 per net ton on **slag**, C. L. (See Note 3), from Birmingham, Ala., district points to Jacksonville, Fla.

8629. **Slate, broken or crushed**, C. L., Bolivar, Ga., to points in Illinois, Indiana, Michigan, New York, Ohio and Pennsylvania, to establish rates as described in Item 736 of S. F. T. B. Freight Tariff 172-D, I. C. C. 1856; Item 7962, Freight Tariff 310-B, I. C. C. 1880, and Item 3559, Freight Tariff 314,

I. C. C. A737, from Bolivar, Ga., to East St. Louis, Ill. (proper and proportional), Chicago, Chicago Heights, Ill., Cleveland, O., Detroit, Mich., Franklin (Warren Co.), O., Joliet, Ill., Lockport, N. Y., Marseilles, Ill., Niagara Falls, N. Y., South Bend, Ind., Vandalla, Waukegan, Wilmington, Ill., York, Penn. The same rates as applicable from Fairmount, Ga.

8639. It is proposed to amend all tariffs publishing rates on plaster, C. L., between points in southern territory, on the one hand, and points in official (including I. F. A.) territory, on the other, by adding "**ground gypsum**, in straight carloads or in mixed carloads with plaster and articles taking same rates, carload, minimum weight 40,000 lb." to plaster commodity description.

8646. **Sand and gravel**, C. L., Carrollton, Ky., to Chilesburg and Pine Grove, Ky. In lieu of combination rates now applicable, it is proposed to establish intrastate rate of 130c per net ton on sand and gravel, C. L. (See Note 3), from and to above named points. Made with relation to rate recently established from Carrollton, Ky., to Mount Sterling, Ky.

8657. Big Clifty, Black Rock, Bowling Green, Garfield, Rockport and Summit, Ky., to Southern territory. It is proposed to establish rates on **asphaltic sandstone** (processed), viz., asphaltic sandstone having a natural bitumen content of not in excess of 5½% broken, crushed or ground, to which asphalt has been artificially added, C. L. (See Note 3), from Kentucky producing points to points in the South 150 miles and more from the nearest producing point on basis of column 2 (joint line) scale shown in Section 2, S. F. T. B. Tariff 214, I. C. C. 1484, and using average mileage for the group.

8680. **Limestone and marble**, ground or pulverized, C. L., Mascot, Strawberry Plains and Knoxville, Tenn., to points in Mississippi, Grand Junction and Memphis, Tenn., Mobile, Ala., and New Orleans, La. It is proposed to restrict the application of the rates on ground or pulverized limestone from and to the points mentioned, so as not to apply on traffic moving in open top equipment. For future rates on traffic moving in open top equipment see S. F. T. B. Ground Limestone Tariff I. C. C. 1676.

8682. It is proposed to revise present rates on **sand, gravel, crushed stone, slag, rubble stone, broken stone and chert**, C. L., from certain Alabama points to certain Florida points named in Agent Pope's Florida Sand and Gravel Tariff 408-A, I. C. C. 1540, to basis of the I. C. C. Docket 17517 scale applied to Docket 13494 formula distances, plus Florida arbitraries south of the Florida gateways through which the short line distances are computed.

8702. It is proposed to establish commodity rates on **crushed stone**, C. L. (See Note 3), but in no case shall minimum weight be less than 90,000 lb., from C. & O. Ry. stations, viz., Rocky Point, Indian Rock and Eagle Mountain, Va., to Danville and Western Ry. stations, Stuart to Whitfield, Va., inclusive; also stations on the Leaksville Branch, predicated upon the Docket 17517 joint line scale for the short line workable distances, in lieu of the present rates, which are on combination basis.

8709. It is proposed to establish rate of 200c per net ton on **feldspar**, in packages or in bulk, C. L., minimum weight 60,000 lb., from Franklin, N. C., to Kings Creek, S. C.

Western

Sup. 1 to D-41-76. **Stone, crushed, slag and/or gravel and sand**, coated with oil tar or asphaltum, C. L., from Ottawa, Ill., to points in Indiana, change the commodity description to read: **Stone, crushed, slag and/or gravel and sand**, coated with oil tar or asphaltum, in open top equipment, C. L. (See Note 3).

D-41-79. **Limestone**, crushed or ground, (See Note 3). In no case shall the minimum weight be less than 40,000 lb., from Omaha, Neb. (Rates in cents per 100 lb.)

To	Proposed
Chicago, Ill.	13½ *12½
Milwaukee, Wis.	13½
Tams, Ill.	14½
St. Paul and Minneapolis, Minn.	13

*Applies only on traffic destined to points east of the Illinois-Indiana state line; also points in Carolina or Southeastern territory.

D-41-81. **Sand, also stone, crushed**, C. L. (See Note 3), but not less than 54,500 lb. Note: When, for carriers' convenience, cars are furnished of greater capacity than ordered, Note 2 will apply, but not less than 54,000 lb., from Randville, Mich., to destinations in lower Michigan.* Proposed (in cents per ton), to Adrian, Mich., 290; Battle Creek, Mich., 290; Cheboygan, Mich., 225;

Emerson, Mich., 240; Gaylord, Mich., 235; Niles, Mich., 305; Roscommon, Mich., 240.

D-195. **Dolomite**, roasted, C. L. (See Note 2), from Chicago, Ill., to Pueblo and Minnequa, Colo. Proposed, 29c per 100 lb.

Sup. 1 to E-41-72. **Stone, crushed**, viz., roofing granules, C. L., minimum weight 80,000 lb., from Wausau, Wis., to Baltimore, Md. This subject has now been canceled from the docket.

E-195-1. Rates, **dolomite**, in open top cars, C. L. (See Note 2), from Manitou, Colo., to Okmulgee, Okla. Proposed, \$3.30 per net ton plus emergency charge.

Southwestern

5509. **Sand and gravel**, Pyatt, Ark., to Springfield, Mo. It is proposed to establish rate of 85c per ton, C. L., as described in S. W. L. Tariff 162-I.

5554. **Lime (calcium), carbonate of**. It is proposed to establish Class 20 rating, minimum weight 40,000 lb. on lime (calcium), carbonate of, from, to and between points in the Southwest and Kansas-Missouri territories.

5604. **Asphalt rock**, Sulphur, Okla., to Fremont, Neb. It is proposed to establish rate of 550c per net ton on crushed asphalt rock, C. L. (See Note 1), from Sulphur, Okla., to Fremont, Neb., applicable via St. L.-S. F., Kansas City, Mo., and connections.

5608. **Crushed asphalt rock**, Sulphur, Okla., to Omaha, Neb. It is proposed to establish rate of 20c per 100 lb., C. L., minimum weight marked capacity of car, from Sulphur, Okla., to Omaha, Neb., applicable via St. L.-S. F., Kansas City, Mo., and connections.

5657. **Asphalt rock and asphalt coated stone**, Oklahoma to Texas. It is proposed to amend Items 950, 952-B, 1896, 1914, 1926-A and 2820, S. W. L. Tariff 26-A, by adding the following: "With each carload of asphalt rock there may be included in the car liquid asphalt and/or road oil not in excess of 3% of the total weight of the shipment, the liquid asphalt and/or road oil to be subject to the carload rates on each and the entire mixture to be subject to the minimum weight applicable on asphalt rock." Also amend Item 2830, S. W. L. Tariff 26-A, by adding the following: "With each carload of **asphalt coated stone**, crushed, there may be included in the car liquid asphalt and/or road oil not in excess of 3% of the total weight of the shipment, the liquid asphalt and/or road oil to be subject to the carload rates on each and the entire mixture to be subject to the minimum weight applicable on asphalt rock."

5677. **Sand and gravel**, Memphis, Tenn., to West Memphis, Ark. It is proposed to establish rate of 40c per net ton, not subject to Ex Parte 115 emergency charge, C. L., from Memphis, Tenn., to West Memphis, Ark., via St. L.-S. F. direct.

5750. **Crushed stone**. It is proposed to establish rate of 182c per ton of 2000 lb. from Pilot Knob, Mo., to Jonesboro, Ill., and intermediate points.

Texas-Louisiana

9758-TX. Proposition to establish a rate of 43c per ton of 2000 lb. on **sand and gravel**, in straight or mixed carloads, standard minimum weight, from Mile Post H-754-5 on the Mineola branch of the M.-K.-T. of T. two miles northwest of Golden, Tex., to Lone Oak and Point, Tex., and a rate of 52c per ton of 2000 lb. to Greenville, Tex., to expire with Dec. 31, 1935.

Illinois

8093. **Rubble stone**, in open top cars, in carloads (See Note 3), from Kankakee, Lehigh, Van's Siding and West Kankakee, Ill., to Waukegan, Ill. Proposed, \$1.39 per net ton.

From	Pres.	Prop.
Krause-Stolle	63	51
Falling Springs	73	61

Transcontinental

17379. Request for rate of \$8 per net ton (40c per 100 lb.) on **roofing granules (crushed stone)**, in bulk, in box cars (See Note 2), but not less than 80,000 or 100,000 lb., from Group D to California, Tariff 1-P.

Digest of Foreign Literature

By F. O. Anderegg, Ph. D.

Consulting Specialist, Long Island City, N. Y.

Testing, Choice and Acceptance of Cements for Highway Construction. Prof. Otto Graf of Stuttgart has ably summarized the present status of the German technology on this subject. He points out the unsatisfactory correlation between the standard compression test on earth-dry mixes of cement and standard sand and suggests that a much better correlation can be secured by using a water consistency and by replacing one-third of the standard sand with finer, graded sand. (Graf, *Tonindustrie Zeitung* (1927), p. 1564).

The next property of interest is the volume change, and he reports for a series of ten cements mixed with graded sands a 90-day shrinkage ranging from 0.045 to 0.077%. The shrinkage depends upon the chemical composition of the cement and the method of preparation, finer grinding often increasing the shrinkage tendency. As a result it has been proposed to place an upper limit on the fineness of grinding of a cement. Admixtures, such as calcium chloride, often affecting the shrinkage, may also have to be limited in the amount permissible.

Shrinkage and swelling set up strains in the body which have interesting and not very well understood effects upon strengths. One example is given in the accompanying chart for a test specimen of 5 cm² area of normal mortar in tension. Other data of interest include, for two different cements:

(a) Flexural strength 1:3 with river sand and damp storage for 28 days, 936 and 914; after 2 days' drying out, 786 and 638, a marked drop; after 4 days' drying, 986 and 686; after 12 days' drying, 1086 and 957; and after 28 days' drying, 1330 and 1186 lb. per sq. in. respectively.

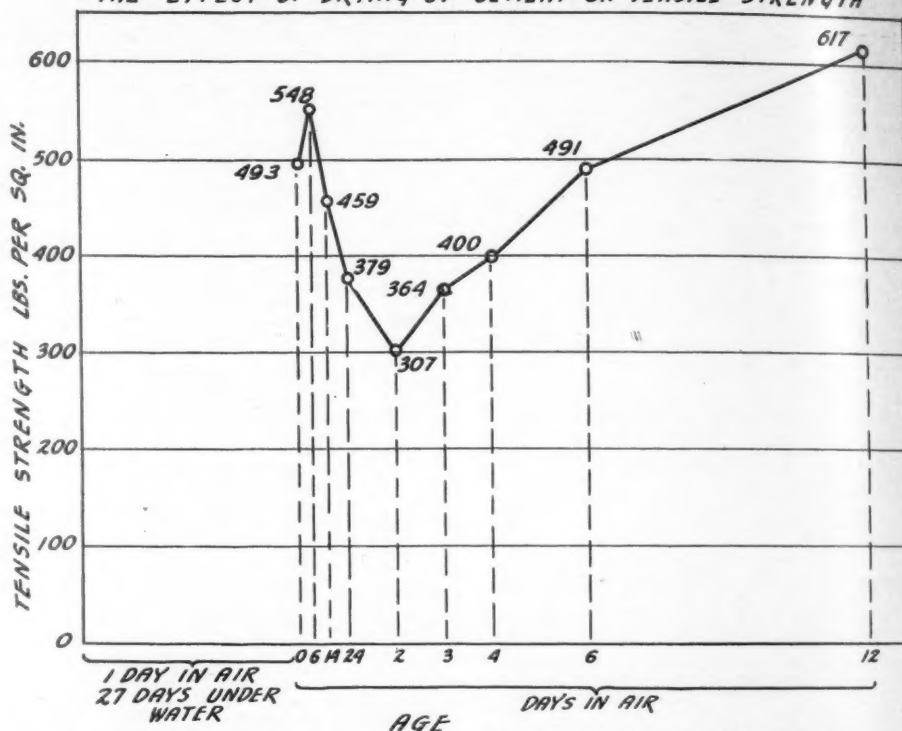
(b) The shrinkage after 90 days, 0.048 and 0.077%.

(c) The modulus of elasticity for a 1:5 mix with river sand at a soft consistency and stored damp 7 days and then 49 in the air, 3,810,000 and 3,360,000 lb. per sq. in. The second cement was more strained in drying than the first and in actual practice showed more cracking.

While the permeability is of interest, the large amount of cement required to secure proper workability in highway construction, insures proper resistance to moisture penetration. The elasticity and strain developed to the breaking point are largely dependent upon the cement. In one series of 12 cements tested in flexure, the modulus of elasticity varied from 3,760,000 to 4,840,000, while the strain just before breaking for combined storage lay between 0.00154 and 0.000209 and for wet storage between 0.000194 and 0.000254 in. per in.

In highway construction the effect of

THE EFFECT OF DRYING OF CEMENT ON TENSILE STRENGTH



temperature must be considered. Thus very low temperatures may have a lasting detrimental effect on strengths, so that the proper cement should be chosen for such conditions. Resistance to abrasion is usually not very important, although that to aggressive solutions may be for certain conditions. The water retaining capacity of the cement may be quite important: on the one hand to insure adequate water for hydration, and on the other to permit the removal of excess mixing water. Differences in heat conductivity and in the thermal coefficient of expansion have also been noted and may need to be considered.

The following tests should be made in the factory laboratory as control measures: (a) chemical composition of the raw mix and of the cement within defined limits; (b) uniform and thorough burning of the clinker; (c) elimination of admixtures which may hurt the shrinkage or other properties of the cement; (d) fineness of the raw mix and of the cement within certain limits; (e) determination of initial and final set; (f) fabrication and testing of prisms and cubes using graded sand (2 parts standard and 1 of finer graded sand) in wet consistency, with strengths within certain limits; (g) comprehensive testing of the shrinkage properties, which must lie within agreed limits, and (h) soundness tests. *Beton u. Eisen* (1935) 34, No. 6, p. 89.

Iron Oxide in High Alumina Portland Cement. Yoshiaki Sanada found

that the addition of iron with increase in Brownmillerite formation in portland cements containing rather large amounts of alumina tended to slow up the initial set slightly and to increase the tensile strength although the compressive strength was not helped appreciably. On aerating in the laboratory for 15 to 20 days, the ignition loss and water requirement were increased, the cement lowest in iron became quick setting, while the ones with higher iron content became quite slow in reaching their initial set. All lost about 15% of their strength by this aeration. For a standard cement of good strength S , suggests: $10 C_3S + 3 C_2S + 15 C_3A + C_4AF$ and for high early strength: $12 C_3S + 0.5 C_2S + 2.5 C_3A + 1.5 C_4AF$. *Journal of the Society of Chemical Industry, Japan, Suppl. Binding* (1935) 38, No. 3, p. 99B.

Studies on High Iron Cement. By starting with pure chemicals, a cement containing SiO_2 , 22.3; Al_2O_3 , 1.0; Fe_2O_3 , 9.9; and CaO , 66.5% could not be satisfactorily burned even with a temperature of 1400 deg. C. for one hour until CaF_2 was added. In a similar cement with a higher Al_2O_3 content of 4.6% and the iron reduced to 6.9 the fluoride aided burning in one hour at 1350. On replacing about 5% of the lime with magnesia it was found that the clinker was properly burned in 1 hour at 1350 deg. C. without any fluorspar. *Journal of the Society of Chemical Industry, Japan, Suppl. Binding* (1935) 38, No. 3, p. 96B.

Mineral Aggregates Institute Is Launched

After Much Debate the Boards of Directors of the National Crushed Stone Association, the National Sand and Gravel Association and the National Slag Association Agree to a Federation of Limited Powers and Scope

AT A JOINT MEETING of the boards of directors of the three national associations in the mineral aggregates industry, at Chicago, Ill., June 30, under the chairmanship of John Prince, R. J. Potts, past president of the National Sand and Gravel Association, another ardent advocate of a real consolidation of the three associations, aptly said: "Before the adoption of our Constitution of the United States we had eight years of the Articles of Confederation, so it is not surprising, even if disappointing, that these three independent associations cannot immediately agree to real union or centralization." That really expresses the sentiment, or opinion, in these industries, even though there was much evidence of extreme opinions both ways. It was admitted, practically unanimously, in private if not in public, that a real consolidation or amalgamation of the three associations was ultimately inevitable.

The greatest accomplishment at these meetings was the adoption of the following resolution, drafted by a committee of six, two from each industry (W. E. Bliss and C. L. McKenzie, slag; H. V. Owens and Wm. Kline, sand and gravel; Stirling Tomkins and H. E. Rhodes, crushed stone):

(1) There shall be organized "The Mineral Aggregates Institute," the members of which shall be the National Crushed Stone Association, the National Sand and Gravel Association, and the National Slag Association. Each of the three member associations shall maintain its present organization and separate identity.

(2) There shall be a governing board of six, two of whom shall be chosen by each of the three member associations.

(3) The governing board shall elect a president from its membership, and an executive secretary and treasurer from the paid staffs of the member associations. The president and other members of the governing board shall serve without compensation.

(4) The first duty of the executive secretary and of the treasurer shall be to the Institute, which shall reimburse the member associations for salaries of the executive secretary, the treasurer and other association employees in proportion to the time devoted by them to Institute affairs, and for such other expenses as may be incurred by the member associations in the conduct of Institute business.

(5) The expense of the Institute shall be divided among the three member associations in proportion to the tonnage, or dollar value, of the production of each.

(6) The duties of the Mineral Aggregates Institute as administered by its governing board shall be to consider and act upon matters commonly affecting the interests of the three member associations. These shall include national legislative and governmental relations, important freight rate proposals, and such other matters of common interest as the governing body by unanimous consent may determine.

(7) Subject to the approval of the three member associations, the governing board shall adopt rules and regulations for the conduct of the business of the Institute.

Election of Governing Board

The boards of directors of the three associations elected as members of the governing board of the Institute: Otho M. Graves and Russell Rarey, crushed stone; Harold V. Owens and Alex Foster, Jr., sand and gravel; C. L. McKenzie and H. N. Snyder, slag. (These six are the same who formed the executive council of the Code Authority.) They met at once and elected Otho M. Graves, chairman, and appointed V. P. Ahearn, executive secretary, and J. R. Boyd, treasurer; so the actual makeup of the Mineral Aggregates Institute is identical with that of the working committee of the industries under their NRA code.

Three Plans Considered

The industries had had some opportunity to study and pass upon three plans for a continuation of their joint activities, grading down from a consolidation of the administrative work of the three associations (with separate engineering and research activities) to a kind of federation of the three present associations, which would be without independent status as to officers or income. A questionnaire to the industry had not been adequately answered up to the time of these meetings, but an analysis of preliminary returns would indicate to ROCK PRODUCTS, at least, that the members of the three industries, by and large, favor much more of a consolidation than was effected at this meeting.

As pointed out by several members at the joint session, the proposed plan is weak in that it does not provide for any financial support of the Aggregates Institute save through membership in one or the other of the three associations. Many believed that provision should be made to obtain the support of other members of the industry who do not wish to contribute to the associations, the principal objectives of which are research and promotion. Such a plan may yet be worked out, for the outline of the organization adopted is not final, but probably merely a starting point. Several members believed that pressure from the industry through local groups in the three industries, or in two of them, which are already organized as single working units, will force adoption of a more compact kind of an Institute than that here provided for.

Arguments Pro and Con

Of course, ROCK PRODUCTS is not at liberty to report verbatim arguments that took place

at board meetings, at which its representatives were guests, nor would the industry be much enlightened were it done. Suffice to say that every argument for and against a consolidation was given an airing; and that even in the light of experience under their NRA code, the members of the boards of directors of these three national associations were undoubtedly influenced more by sentiment and by personal judgments by individuals of other individuals than by weightier considerations. However, everyone recognized that a greater degree of harmony would be essential to the successful launching of a single new consolidated association, and that a step so radical need not necessarily be made at one time.

One inference is unescapable; that is, there was an almost universal feeling that code administration costs had been excessive and that the same result can be accomplished at less expense—a probably natural reaction at being released from compulsory taxation, but one that time may change. Anyhow, just now there are many who believe a consolidation would be more expensive than the three separate associations, illogical as that may appear to those who do not understand all the considerations involved.

There was also a noteworthy element which believed in an even more complete consolidation than was contemplated in any of the three plans discussed—a complete consolidation including one single research laboratory. Some of these were so much in favor of a merger, and for no halfway step, that logically they could support only the other extreme, the confederation idea, when it was obvious an actual consolidation was out of the question at this time.

The principal other business of the joint session was the unanimous adoption of the resolution on page 59, following.

National Crushed Stone Association Directors Meet

IN ADDITION to the joint sessions with the directors of the two other associations in the mineral aggregates industry, the directors of the National Crushed Stone Association met in Chicago, Ill., June 29 and 30, to transact the routine business of the organization. Most of the time was spent debating the virtues of a consolidation with the other two groups. No action was taken to select a time and place for the 1936 annual convention other than to refer the matter to the executive committee.

A. T. Goldbeck, director of the bureau of engineering of the association, submitted a progress report in which he said: "At no

time in our history have we been as busily engaged in laboratory research as has been the case during the past six months. Brief mention will be made of the types of investigation undertaken.

"1. Circular track tests. The circular track in our laboratory has proven to be the most useful machine in our possession and its merits have been recognized elsewhere by the building of similar machines in Federal and State testing laboratories. We have investigated a large number of Amiesite mixtures and other types of cold laid bituminous concrete mixtures and as a result have written a standard specification which we hope to have adopted in the various state highway departments. We recently conducted an investigation on the influence of dust-coated stone when used as a cover material for surface treatment work and have come to certain conclusions regarding the effect of dust. These will shortly be given to the industry. We have likewise conducted a number of tests to determine the resistance of various stones to crushing under the roller, and these results have been invaluable in showing the desirability of certain materials and the undesirability of others, and they have furnished a means for writing quality specifications in the particular states involved.

"Investigations have also been undertaken by the use of the track to determine the causes for the release of the bituminous film from stone under the action of water. At the present writing no results are yet available. We have cooperated with the District of Columbia in a series of tests on Amiesite and other bituminous mixtures in order to predetermine which of these mixtures is the best under severe traffic. Identical mixtures were laid on an important artery of traffic in the District of Columbia and it is interesting to note that our circular track tests evaluate these different mixtures in identically the same way as they would be evaluated under the action of traffic. We know definitely now that the results of the circular track may be accepted with confidence that they are indicative of service behavior.

"In addition to the circular track tests, a large series of tests is under way for the Pennsylvania Stone Producers' Association. This investigation involves the testing of some 15 tons of aggregate samples and it involves also the use of some 80 or 90 bags of cement for the manufacture of the necessary concrete specimens. The investigations include crushed stone, gravel, crushed gravel, blast furnace slag, and natural and stone sand from different localities. Not only is the concrete placed in the usual way, but vibration also is used. We have designed and built our own vibration machine for laboratory purposes only. The tests are interesting in showing the extremely high beam strengths obtained with the stone sand concrete. The final tests will involve expansion and contraction measurements on these various concretes.

"We have likewise conducted a number of investigations at the request of individual

producers for different purposes and these extend from routine tests on samples of materials up to complete concrete investigations. It can readily be understood why, with our very small laboratory force, we have been unusually busy during the past six months. This work, however, has not been accomplished except by much overtime work, including Sundays, evenings and holidays. Your association is fortunate in having an unusually competent and reliable laboratory force.

"In connection with our laboratory work mention should be made of a new piece of equipment, the Los Angeles rattler machine, which was recently given to us by the Standard Lime and Stone Co. of Martinsburg, W. Va., in recognition of services which we rendered to the Maryland stone producers. It is needless to say that your bureau of engineering greatly appreciated receiving this piece of equipment.

* * * * *

"Judging from the intense interest in our laboratory investigations by those in the association who have taken the trouble to make use of our services, and judging also by the value of the results obtained and their ready acceptance by those with whom we have to deal, it can be said with no hesitation whatever that the engineering features of the crushed stone association have been of exceptional value to the industry. This statement is made with no thought of boasting, but as a simple statement of fact. No matter what form of organization the aggregates industries may take in the future, I think by all means the engineering and research work of the National Crushed Stone Association should be continued and enlarged. Our laboratory force cannot continue the pace they have been setting during the past six months. There has been talk of a joint research laboratory for the three associations. This would retard the production of worth-while research information rather than accelerate it, and for psychological reasons it is doubtful if such a laboratory would continue to receive financial support. It is my hope that our own research work may be continued and on a growing scale as rapidly as our finances will permit."

Directors Present

The following directors were present:

Russell Rarey, Marble Cliff Quarries Co., Columbus, Ohio, chairman.

W. M. Andrews, Union Limestone Co., New Castle, Penn.

W. P. Beinhorn, The Trap Rock Co., Minneapolis, Minn.

A. J. Blair, Lake Shore Sand and Stone Co., Milwaukee, Wis.

J. R. Boyd, secretary, National Crushed Stone Association, Washington, D. C.

J. R. Callanan, Callanan Road Improvement Co., South Bethlehem, N. Y.

E. Eikel, Servtex Materials Co., New Braunfels, Tex.

A. T. Goldbeck, director, Bureau of Engineering, National Crushed Stone Association, Washington, D. C.

E. J. Krause, Columbia Quarry Co., St. Louis, Mo.

Thos. McCroskey, American Limestone Co., Knoxville, Tenn.

Paul M. Nauman, Dubuque Stone Products Co., Dubuque, Iowa.

John Prince, Stewart Sand and Material Co., Kansas City, Mo.

H. E. Rodes, Franklin Limestone Co., Nashville, Tenn.

W. R. Sanborn, Lehigh Stone Co., Kankakee, Ill.

James Savage, Buffalo Crushed Stone Co., Buffalo, N. Y.

F. W. Schmidt, Jr., Morris County Crushed Stone Co., Morristown, N. J.

L. W. Shugg, General Electric Co., Schenectady, N. Y.

W. L. Spurborg, General Crushed Stone Co., Syracuse, N. Y.

Stirling Tomkins, New York Trap Rock Corp., New York City.

T. I. Weston, Weston and Brocker Co., Columbia, S. C.

Harold Williams, Boston, Mass.

W. F. Wise, Southwest Stone Co., Dallas, Tex.

F. O. Wyse, Bucyrus-Erie Co., South Milwaukee, Wis.

O. M. Graves, General Crushed Stone Co., Easton, Penn. (guest).

I. A. Ogden, Servtex Materials Co., New Braunfels, Tex. (guest).

National Sand and Gravel Association Directors Meet

BESIDES debating the desirability of a common association of all mineral aggregate producers, the board of directors of the National Sand and Gravel Association, meeting in Chicago, Ill., June 29 and 30, transacted its usual routine business. No action was taken on the selection of a time and place for the next annual convention, this being left for the executive committee to decide.

The most interesting subject discussed was the seriousness of government competition, of one kind or another, in the production of sand and gravel. E. Guy Sutton, chairman of a committee comprised of L. T. McCourt, Robert J. Potts, Eric Ryberg and William Stoner, submitted a progress report in which he said:

"I have suggested that the problem be approached, first, by compiling the various factors, economic, political, and otherwise that have contributed toward influencing the governmental units to enter the field of production in our industry, and second, by analyzing such factors to determine what remedial action might be taken.

"Proceeding along this line, the following factors are listed to serve as a preliminary basis of discussion with the idea that thereby other contributing causes may be developed:

"1. The growing tendency of divisions of government, both federal and state, to invade private enterprise.

"2. The encouragement by the Bureau of Public Roads in the promotion of low type gravel roads for secondary highways which may be constructed cheaply with poorly graded and unprocessed aggregates secured from wayside pits.

"3. The evolution of the large motor truck as a highly suitable vehicle for the trans-

UNANIMOUSLY ADOPTED!

WHEREAS, in his annual message to the 74th Congress the President sought legislative approval of the expenditure of \$4,000,000,000 in a work relief program; and

WHEREAS, the President justified such expenditure on the ground that all work undertaken should be useful, not only temporarily, but useful in the sense that it would afford permanent employment in living conditions or create future new wealth of the nation; and

WHEREAS, the recommendations of the President were declared by him to offer the promise and the possibility of stimulation of general business recovery, particularly in the durable goods industries; and

WHEREAS, the resolution adopted by the Congress pursuant to the President's proposal provided for the use of the facilities of private enterprise in the carrying out of the legislative mandate; and

WHEREAS, rules and regulations subsequently issued by the President for the expenditure of the authorized funds contain regulations which nullify the program originally sponsored by the President and can result only in the carrying on of work which will not add to the future wealth of the country or furnish permanent employment; and

WHEREAS, such rules and regulations will have the inevitable effect of creating unemployment where employment now exists in the durable goods industries, thus aggravating the conditions which Congress intended to eliminate; and

WHEREAS, the said rules and regulations hold the active threat of increasing the governmental production of crushed stone, and sand and gravel, now already at a point which endangers the continuance of private enterprise in these important fields; now, therefore, be it

RESOLVED, by the Boards of Directors of the National Crushed Stone Association, National Sand and Gravel Association, and National Slag Association, assembled in joint session at Chicago, on June 29, 1935, that they condemn the said rules and regulations as being unwarranted in either an economic or social sense, and as a direct contradiction not only of the announced policies of the President but also of legislation subsequently adopted by the Congress; and be it further

RESOLVED, that the alarming situation created by the said rules and regulations shall be brought to the attention of each producer of crushed stone, sand and gravel, and slag, accompanied by a suggestion that he communicate with his representatives in Congress for the purpose of enlisting their coöperation and seeking a modification of the said rules and regulations; and be it further

RESOLVED, that the respective executive committees of these boards shall request members of the industries to submit information regarding the scope and extent of unemployment which will necessarily grow out of the said rules and regulations if they are not modified in accord with the principles of this resolution.

portation of sand and gravel for comparatively long distances.

"4. The maintenance by the railroads of a high level of freight rates on mineral aggregates.

"5. The activity of machinery manufacturers in promoting the sale to governmental agencies of portable equipment that has been developed to a fairly high state of efficiency especially for the production of materials under lax specifications.

"6. The production of the products of our industry by county and township units as a means of relieving unemployment locally.

"7. The gross misconception of the cost of production and the fine opportunity presented for governmental units to cover up or submerge many items of cost.

"Taking the foregoing seven factors in the order named, the following observations seem pertinent and again are presented for the purpose of provoking intelligent discussions on the subject:

"1. By uniting our efforts with other industries and professions that are facing a like condition, it should be possible to curb the tendency of the governmental agencies to invade the province of industry. A stubborn obstacle to overcome in that connection is the persistence of governmental employees to perpetuate their jobs and to build up political power, especially in rural communities.

"2. The development of the truck denotes progress in transportation facilities and cannot be forestalled even if we so desired.

"3. The railroads in many sections of the country are reducing freight rates to meet individual situations, which might be recommended as a better plan for countrywide adoption than to seek general reduction in rates.

"4. At the present time it seems to be more alluring to the manufacturer of sand and gravel machinery to push the sale of portable equipment rather than equipment for permanent plants, and it is doubtful whether anything can be done about it, since we can have no control over another field of commercial activity.

"5. It should be easy to persuade the Bureau of Public Roads as well as the various state highway departments that have followed the lead of that Bureau, that low types of highway construction, for example, the so-called stabilized road, conceived and fostered by the producers of calcium chloride, is not meeting the demand for suitable secondary highways and that the political subdivisions and consequently the taxpayers are not getting adequate value for the money invested in the building of such types of roads.

"6. As to relieving unemployment, it should be apparent to any division of government that any effort to provide temporary employment for a few men locally deprives other employees of work that might be more permanent in character.

"7. With reference to the misconception of the cost of production, Robert J. Potts has

analyzed that situation in his characteristic and forceful way, and I quote from his letter:

The layman, and even the technical man without practical experience in our line, will, upon being questioned, give you some of the most fantastic statements as to the cost of producing and preparing a ton of aggregates. This incorrect idea may be traced to two causes:

(a) Before beginning such operations, those responsible for these figures have absolutely no cost data and no practical operating experience which would enable them to even enumerate all real, proper, and unavoidable elements of cost that will actually be encountered as a going operation. To them it is purely a case of trying to compute the unit cost for a straightforward continuous operation for a few hours or a few days without interruption, breakdown or delays; without any accounting, sales expense, or advertising—in other words, just about what a member of the Ancient and Honorable Order of Steam Shovel Watchers would conclude it cost to scoop up a bucketful of material and drop it in a car. This idea of cost is nearly always aided and abetted by the industrious and overzealous machinery salesman, referred to in your number four, who is usually devoid of any actual practical experience and bases what analysis he attempts to make on an overestimated factory rating of equipment of plant units engaged in fair-weather going.

(b) Where operations have already been under way for some time some of the cost elements entirely overlooked at the beginning are dimly recognized and partially evaluated, but still their so-called cost record will be far from correct. For instance: They use the taxpayer's money, but there is never a charge for capital; their accounting and pay-off is nearly always handled by somebody on the public payroll whose pay check is not charged against the operation "because they are hired anyhow"; in general, no insurance is carried, and if an employee is injured in a project where the government is not subject to torts the poor fellow is just out of luck; depletion and depreciation are never included in one out of a hundred; taxes of course do not apply. Of course every one of the elements of cost just enumerated do actually exist and the poor old taxpayer is unwittingly digging up for them.

(c) In very many if not most operations that have been going on, the erroneous or ignorant misrepresentation of cost described under (a) and (b) becomes deliberate and intentional. Those responsible naturally wish to make a showing and they easily convince themselves that such or such element of cost is not pertinent or should not apply to their particular part of the community effort. Oftentimes they excuse themselves on the ground of furnishing needful employment, somewhat as indicated in your number six, but actually with the intent and effect of building up the public payroll crowd for political purposes.

"In my opinion the most effective means for curbing the encroachment of production by governmental units, one which can be applied locally and nationally, is to institute an active campaign for the adoption of highly restrictive specifications to apply on our materials by all highway departments, including the Bureau of Public Roads. This method of procedure has the sound reason of assuring the construction of better highways to the advantage of the taxpayers and the traveling public. At the same time it will tend to protect investments in our industry and preserve our ability to employ labor.

"So far as the individual producer is concerned, the tightening of specifications might involve some revamping in plant facilities, but that would be of least importance as compared to the alarming loss of business that permanent plants are experiencing because of the steady increase in governmental production. This manner of solving the problem has been highly effective in one state with which I am familiar, to the extent that not only have governmental units ceased the

production of our materials but the so-called irresponsible portable or fly-by-night producers have had to seek other territory and the farmer has been obliged to confine his activities to seedtime and harvest and the development of beef, mutton and bacon.

"In conclusion, let me say that our industry perhaps has been remiss in not attacking this matter sooner. However, it has come upon us gradually and somewhat insidiously, because the matter is impregnated with political aspects. For this latter reason it may be some time before we are able to free ourselves from the tentacles of political power.

"So far as I am aware the only effort that has been made to attack the problem is the adoption of a strong resolution at the meeting of the Code Authority held at Chicago last January, copy of which was sent to the President of the United States. I am not informed what disposition the President made of the resolution, but it is safe to conclude that it was referred to some department where it was buried perhaps without ceremony.

"Realizing the critical character of the situation, your committee recommends very prompt and unremitting action."

Engineering and Research

Stanton Walker, director, engineering and research division of the association, submitted a progress report in which he reviewed the work of laboratory and of the committees of various technical societies of which he is a member. Regarding work in connection with the other two mineral aggregate associations, he said:

"A most important phase of our committee activities is found in the work of the Joint Technical Committee of Mineral Aggregates Associations consisting of the engineering directors of the three National Associations together with the secretary of the National Slag Association. That committee is principally engaged in promoting the standardization of sizes of aggregates and its recommendations have received partial or full acceptance by such organizations as the American Association of State Highway Officials; the Federal Specifications Board, the American Society for Testing Materials, and several state highway departments. Standardization of sizes is an important objective which will be appreciated by members of the association, particularly in the case of adjacent states served by the same group of producers. Our success in the achievement of this aim has been gratifying. The committee has also arranged to cooperate with the Division of Simplified Practice of the Department of Commerce looking toward a general acceptance of common standards for sizes of aggregates, dimensions of screens for commercial production and for testing, and other products pertaining to the industry. A recent activity of importance is represented by the cooperation of the committee with representatives of manufacturers of bituminous materials in an attempt to rationalize specifications for aggregates for

bituminous mixtures. The work of this committee is a prominent example of the ability of the three associations, representing highly competitive industries, to coöperate on common problems."

The following directors attended the Chicago meeting:

Harold V. Owens, Eastern Rock Products, Inc., Utica, N. Y., chairman.
H. N. Battjes, Grand Rapids Gravel Co., Grand Rapids, Mich.
Paul P. Bird, Boston Sand and Gravel Co., Boston, Mass.
Otto S. Conrades, St. Louis Material and Supply Co., St. Louis, Mo.
Anderson Dana, Seaboard Sand and Gravel Corp., New York City.
Otto J. Ellinger, H. D. Conkey and Co., Mendota, Ill.
C. S. Huntington, Link-Belt Co., Chicago, Ill.
W. H. Klein, Dixie Sand and Gravel Co., Chattanooga, Tenn.
Mark T. McKee, Sand Products Corp., Detroit, Mich.
C. F. Mullen, Florida Gravel Co., Chattahoochee, Fla.
Robert J. Potts, Potts-Moore Gravel Co., Waco, Tex.
J. M. Settle, Ohio River Sand and Gravel Co., Louisville, Ky.
J. L. Shiely, J. L. Shiely Co., St. Paul, Minn.
H. N. Snyder, Buffalo Slag Co., Buffalo, N. Y.
Wm. Stoner, Western Sand and Gravel Co., Lincoln, Neb.
A. Warsaw, Wedron Silica Co., Chicago, Ill.
H. E. West, West Sand Co., Muskogee, Okla.
Charles H. Young, Robbins-Young Co., Minneapolis, Minn.

National Slag Association

THE board of directors of the National Slag Association met in Chicago, Ill., June 29 and 30, for a joint session with the boards of the National Sand and Gravel Association and the National Crushed Stone Association. Besides a debate on the merits of a consolidation of the three associations, the directors attended to routine business. The following were present:

C. L. McKenzie, Duquesne Slag Co., Pittsburgh, Penn., chairman.
C. E. Ireland, Birmingham Slag Co., Birmingham, Ala.
W. E. Bliss, Standard Slag Co., Youngstown, Ohio.
N. D. Connelly, Chicago, Ill.
Fred Hubbard, Midland Slag Co., Youngstown, Ohio.
G. A. Mattison, Jr., Woodstock Slag Co., Birmingham, Ala.
L. E. McDermut, Illinois Slag and Ballast Co., Chicago, Ill.
H. N. Snyder, Buffalo Slag Co., Buffalo, N. Y.

Ready-Mixed Concrete Association

THE BOARD OF DIRECTORS of the National Ready-Mixed Concrete Association met in Chicago, Ill., July 1, and decided to continue the association with the present nominal dues of \$15, pending developments between now and the time of the annual meeting of the association next January. As at present, the office of the association will be that of the National Sand and

Gravel Association, Munsey Bldg., Washington, D. C. The directors present were:

H. F. Thompson, St. Louis, Mo., chairman; Paul P. Bird, Boston, Mass.; J. L. Shiely, St. Paul, Minn.; A. C. Avril, Cincinnati, Ohio; Alex Foster, Jr., Philadelphia, Penn.; J. F. McCracken, Louisville, Ky.; Stanton Walker, secretary.

California Mineral Aggregate Producers Hang Together

THE accompanying reproduction of a two-thirds page newspaper advertise-

ment needs little explanation. It appeared in the following: *San Francisco Examiner*, *San Francisco Chronicle*; *The Call-Bulletin*; *The San Francisco News*; *The Post Oakland Enquirer*; *Oakland Tribune*; *The Sacramento Bee*; *The Fresno Bee*; *Stockton Record*.

The producers of northern California are now holding a series of meetings for the purpose of discussing their problems and attempting to work out some plan for the future that will save for the industry the benefits that accrued under the Code.

The undersigned members of the Rock, Sand and Gravel Industry of Northern California

have complied with the National Industrial Recovery Act and the provisions of the Code of Fair Competition for the Rock, Sand and Gravel, and Slag Industries.

The Supreme Court of the United States, by a very broad and definite decision has declared unconstitutional the section of the Recovery Act pursuant to which such codes have been promulgated.

The undersigned, however, will continue the conduct of their business observing the same principles of fair competition and marketing practices, and will maintain the same schedule of wages, hours and working conditions so long as economic and competitive conditions will permit.

NAME OF CONCERN	Operating Plants in the Following Counties
ARROWHEAD GRAVEL COMPANY.....	Santa Clara
ATLAS OLYMPIA COMPANY OF CALIFORNIA.....	Stanislaus, Santa Cruz
BASALT ROCK COMPANY, INC.....	Napa, Sonoma, Contra Costa
BECHTEL-KAISER ROCK COMPANY.....	Butte
BISHOP, E. B.....	Glenn
BLAKE BROTHERS COMPANY.....	Contra Costa
CALIFORNIA ROCK & GRAVEL COMPANY.....	Alameda
CENTRAL SUPPLY COMPANY.....	Monterey, Santa Cruz
DANIEL CONTRACTING COMPANY.....	Marin
DEL PASO ROCK PRODUCTS COMPANY.....	Sacramento
GATES, F. H. INC.....	Santa Barbara
GRANT-SERVICE ROCK COMPANY.....	Fresno
GRANITE ROCK COMPANY.....	San Benito-San Luis Obispo
GOLDEN WEST QUARRY.....	San Mateo
HAYWARD BUILDING SUPPLY COMPANY.....	Alameda
HEIN BROTHERS BASALT ROCK COMPANY.....	Marin
HUTCHINSON COMPANY.....	Alameda, Contra Costa, Marin
IRVINGTON SAND AND GRAVEL COMPANY.....	Alameda
KAISER PAVING COMPANY.....	Alameda, Contra Costa
KERN ROCK COMPANY, LTD.....	Kern
LOS GATOS SAND AND GRAVEL COMPANY.....	Santa Clara
MIRABEL GRAVEL COMPANY.....	Sonoma
MUCKE SAND AND GRAVEL COMPANY.....	Sacramento
NORTHWESTERN GRAVEL COMPANY.....	Sonoma
PACIFIC COAST AGGREGATES, INC.....	Butte, Yuba, Sacramento, Fresno, Tulare San Joaquin, Alameda, Santa Clara, Monterey
PERKINS GRAVEL COMPANY.....	Sacramento
RHODES & ROBINSON.....	Santa Clara
SANTA FE SAND & GRAVEL COMPANY.....	San Joaquin
SAN MATEO FEED & FUEL COMPANY.....	San Mateo
YOLO GRAVEL COMPANY.....	Yolo
YUBA RIVER SAND COMPANY.....	Yuba

Safety Interest in Cement Industry Revives

THE CEMENT INDUSTRY'S answer to the rising industrial accident menace is an intensified program of activities which is bringing safety messages and object lessons to daily and sometimes almost hourly attention of the 17,000 employes now at work in member mills of the Portland Cement Association.

Last year's record showed that cement mills in this group suffered 66% more lost time accidents and 129% more fatal accidents than in 1933. More time was lost per accident and, of course, the severity rating was higher. The challenge presented by the figures produced a tremendous reaction among the mill organizations. And the fight to sweep away hazards and eliminate mishaps is on with more enthusiasm than for several years.

Safety communications and literature from the association have gone out to the member mills and quarries on an average of one piece every two days. Some of these single pieces outline an entire week's safety activities; others contain specific reports of significant accidents with analyses and warnings to the men who face similar hazards throughout the industry.

At all of the twelve regional safety meetings of the series just concluded, attendance exceeded expectations, often exhausting facilities and, in one city, exceeded all previous meetings. Albany, Allentown, Baltimore, Birmingham, Columbus, Dallas, Detroit, Indianapolis, Kansas City, Mason City, Pittsburgh and St. Louis, were the centers at which the mill men assembled. Meetings may be held later in the year in the territory farther west.

Many Win Annual Trophy Contest

With the greater number of personal injury accidents which occurred in the cement mills and quarries in 1934, awards of the Association's trophy for a year's operation without accident were considerably reduced. Eight mills won this award for the first time in 1934 as against twelve first-time winners in 1933. Repeaters won 35 awards in 1934 against 38 in 1933.

In the twelve years of the contest, 112 of the total of approximately 160 eligible plants have won the award one or more times. Of the 1934 winners, one plant has won eight consecutive awards, two plants six awards each, six plants five awards each, ten plants four awards each, ten plants three awards each, and five plants two awards.

1934 Winners

	Date of Last Disqualifying Accident
ALPHA PORTLAND CEMENT CO., Jamesville, N. Y., E. L. Boyne, superintendent	8-30-33
CANADA CEMENT CO., LTD., Mont- real East, Quebec, A. G. Beck, manager	11-9-33
KOSMOS PORTLAND CEMENT CO., Kosmosdale, Ky., A. C. Brown, plant manager	10-23-33
LOUISVILLE CEMENT CO., Speed, Ind., F. H. Compton, superintend- ent	5-18-33

MARQUETTE CEMENT MANUFACTURING CO., LaSalle, Ill., Frank Moyle, general superintendent	11-1-33
MISSOURI PORTLAND CEMENT CO., Sugar Creek, Mo., V. K. Newcomer, superintendent	4-27-33
STANDARD PORTLAND CEMENT CO., Painesville, Ohio, Erie J. Ochs, superintendent	3-20-33
UNIVERSAL ATLAS CEMENT CO., Buffington, Ind., J. H. Kempster, general superintendent	2-14-33

Winners of the Re-awards

ALPHA PORTLAND CEMENT CO., Birmingham, Ala., H. O. Underhill, manager (Previous awards for years 1930, 1932, 1933)	
ALPHA PORTLAND CEMENT CO., LaSalle, Ill., G. Lundberg, superintendent (Previous awards for years 1930, 1933)	
ASH GROVE LIME & PORTLAND CEMENT CO., Chanute, Kan., Guy O. Gardner, superintendent (Previous award for year 1933)	
CANADA CEMENT CO., LTD., Fort Whyte, Manitoba, C. W. Edmonds, superintendent (Previous awards for years 1926, 1930, 1931, 1932)	
CANADA CEMENT CO., LTD., Hull, Quebec, D. A. Gasper, superintendent (Previous awards for years 1927, 1933)	
DIAMOND PORTLAND CEMENT CO., Middle Branch, Ohio, W. W. Kinginger, superintendent (Previous awards for years 1930, 1933)	
GREAT LAKES PORTLAND CEMENT CO., Buffalo, N. Y., A. T. BeVier, superintendent (Previous awards for years 1929, 1930, 1931, 1933)	
LEHIGH PORTLAND CEMENT CO., Birmingham, Ala., R. H. MacFetridge, superintendent (Previous awards for years 1929, 1930, 1931)	
LEHIGH PORTLAND CEMENT CO., Iola, Kan., C. A. Swiggett, superintendent (Previous awards for years 1927, 1928, 1929, 1930, 1931, 1932, 1933)	
LEHIGH PORTLAND CEMENT CO., Ormrod No. 3, Penn., Wm. J. Montz, superintendent (Previous awards for years 1928, 1929, 1931)	
LONE STAR CEMENT CORP., Bonner Springs, Kan., John O'Callaghan, superintendent (Previous awards for years 1927, 1932, 1933)	
LONE STAR CEMENT CO. NEW YORK, INC., Hudson, N. Y., John Norvig, superintendent (Previous award for year 1933)	
LONE STAR CEMENT CORP., Nazareth, Penn., E. C. Champion, superintendent (Previous awards for years 1929, 1933)	
LONE STAR CEMENT CO. TEXAS, Dallas, Tex., Wm. Moeller, superintendent (Previous award for year 1932)	
LONE STAR CEMENT CO. TEXAS, Houston, Tex., Louis J. Wheeler, general superintendent (Previous awards for years 1930, 1932, 1933)	
MANITOWOC PORTLAND CEMENT CO., Manitowoc, Wis., F. E. Town, superintendent (Previous awards for years 1930, 1931, 1932, 1933)	
MARQUETTE CEMENT MANUFACTURING CO., Cape Girardeau, Mo., Robt. Matthews, superintendent (Previous awards for years 1928, 1929)	
MEDUSA PORTLAND CEMENT CO., Toledo, Ohio, W. J. Worthy, superintendent (Previous awards for years 1929, 1930, 1931, 1932, 1933)	
MEDUSA PORTLAND CEMENT CO., York, Penn. (White), E. E. Whitlatch, superintendent (Previous awards for years 1930, 1931, 1932, 1933)	
MEDUSA PORTLAND CEMENT CO., York, Penn. (Gray), E. E. Whitlatch, superintendent (Previous awards for years 1929, 1932, 1933)	
MISSOURI PORTLAND CEMENT CO., St. Louis, Mo., O. F. Schulzke, superintendent (Previous award for year 1933)	
MONARCH CEMENT CO., Humboldt, Kan., C. P. Mitchell, superintendent (Previous award for year 1932)	
NEBRASKA CEMENT CO., Superior, Neb., D. C. Coulson, superintendent (Previous award for year 1933)	
NORTH AMERICAN CEMENT CORP., Howes Cave, N. Y., J. W. Campbell, superintendent (Previous awards for years 1930, 1931, 1933)	
PACIFIC PORTLAND CEMENT CO., Redwood City, Calif., A. G. Lang, superin-	

endent (Previous awards for years 1929, 1930, 1931, 1933)	
PENNSYLVANIA-DIXIE CEMENT CORP., Clinchfield, Ga., E. P. Newhard, superintendent (Previous award for year 1933)	
PENNSYLVANIA-DIXIE CEMENT CORP., Valley Junction, Ia., R. A. Bechtold, superintendent (Previous awards for years 1931, 1933)	
PENNSYLVANIA-DIXIE CEMENT CORP., Portland Point, N. Y., F. P. Werner, superintendent (Previous awards for years 1930, 1932, 1933)	
SOUTHWESTERN PORTLAND CEMENT CO., Victorville, Calif., L. V. Robinson, superintendent (Previous awards for years 1929, 1932)	
SOUTHWESTERN PORTLAND CEMENT CO., Osborn, Ohio, W. T. Groner, superintendent (Previous awards for years 1931, 1933)	
SUPERIOR PORTLAND CEMENT, INC., Concrete, Wash., H. A. Ambler, superintendent (Previous awards for years 1931, 1932, 1933)	
TRINITY PORTLAND CEMENT CO., Fort Worth, Tex., E. L. Gibson, superintendent (Previous awards for years 1930, 1931, 1932, 1933)	
UNIVERSAL ATLAS CEMENT CO., Duluth, Minn., Ray S. Huey, superintendent (Previous awards for years 1925, 1927, 1929, 1932, 1933)	
UNIVERSAL ATLAS CEMENT CO., Universal, Penn., R. L. Slocum, superintendent (Previous awards for years 1930, 1932, 1933)	
WABASH PORTLAND CEMENT CO., Osborn, Ohio, Lester E. Palmer, works manager (Previous awards for years 1929, 1933)	

AWARDS AND RE-AWARDS SINCE SAFETY CONTEST WAS ORIGINATED

Year	Original Awards	Reawards	Total
1923.....	1	...	1
1924.....	1	...	1
1925.....	2	...	2
1926.....	1	1	2
1927.....	8	2	10
1928.....	13	3	16
1929.....	17	9	26
1930.....	26	17	43
1931.....	18	24	42
1932.....	5	36	41
1933.....	12	38	50
1934.....	8	35	42
Totals	112	165	276

Universal-Atlas Cement Co. Dedicates P.C.A. Trophy

THE Buffington, Ind., plant of the Universal-Atlas Cement Co., Chicago, Ill., won a Portland Cement Association safety trophy for the first time this year. The occasion was duly celebrated by a half-day's festivities June 27, honored by the presence of, and addresses by, Governor Paul V. McNutt of Indiana; E. J. Mehren, president of the Portland Cement Association; B. F. Affleck, president of the company; A. H. Young, vice-president in charge of industrial relations, United States Steel Corp., and many other notables.

J. H. Kempster, general superintendent, was master of ceremonies; and C. B. McConnell, safety director, accepted the trophy on behalf of the plant organization. Mr. McConnell, among other things, said:

"We at Buffington gradually awakened from our lethargy and became safety conscious. All of us can remember our early efforts to participate successfully in the Port-



B. F. Affleck

land Cement Association's June No-Accident Campaigns. For many years we were unable to achieve even that result with any regularity. Finally in 1929 we came through the month of June with flying colors. This was our second successful June campaign. Immediately we turned covetous eyes upon the association's trophy for a year free of accidents.

"How discouragingly close we came to winning that prize several times. In 1928 we



E. J. Mehren



J. H. Kempster

completed over 1,770,000 man hours with a clear record. This would be equivalent to a year's work for 606 men working 365 days a year. In 1933 we missed our goal by just one false step. Finally after years of striving, in 1934, we succeeded and today we have completed 862 days without a lost-time accident."



C. B. McConnell



Buffington, Ind., plant of Universal Atlas Cement Co. dedicates P.C.A. safety trophy

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Mosaic Concrete House Competes With Other Prefabricated Dwelling Units

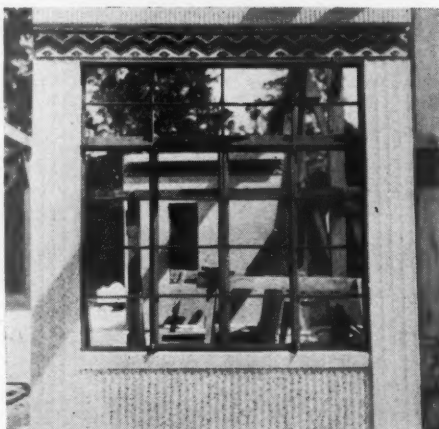
INTEREST in prefabricated housing, newest development in the home building industry, has centered attention on the first house to be built with prefabricated walls of "mosaic" concrete, erected on the Colesville Pike, opposite the Indian Spring Country Club, just north of Washington, D. C. This house emphasizes beauty in its exterior walls to overcome the danger that prefabrication may lead to monotony of a machine-like duplication of design. It is the work of the studios of John J. Earley in Washington, D. C.

The house is built of 32 panels, each nine feet high and varying in width from four to eight feet. The panels are made of two-inch reinforced concrete with a surface of exposed aggregates of red jasperite from Oklahoma, which gives the slabs the appearance of granite.

The slabs are precast, and this fact makes it possible to manufacture them under proper conditions to harden them to a point where they are absorption-proof and water-tight. Window casements are cast into the slabs during the course of prefabrication, thereby avoiding the possibility of leakage and assuring proper alignment.

By a patented process, the slabs are made, face downward, in carefully designed molds carved to give the castings a perfectly "chiseled" surface. The mosaic frieze and the other mosaic decorations of the slabs, are achieved by putting on the plaster forms of the mold, a minute ridge about one-eighth of an inch high to mark the lines between the various colors of the design. The mosaic particles of the colored design, carefully prepared in a mixture of the colored stone and sand crushed from the same stone, together with cement and water, are then placed into their proper position in this design. After the reinforcing mesh is put in position, the mold is filled to a depth of two inches with quartz concrete of the same mixture as the colored concrete in the surface.

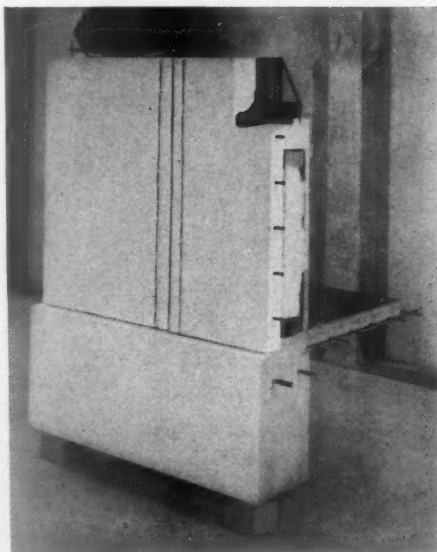
Only the hardest of stone and stone-like materials are used to form the precast slabs. No pigments are used. The aggregates are crushed, the largest flakes being roughly one-half inch in diameter and the sand particles, crushed from the same material, are graded as are the larger particles, to a predeter-



Window panel unit of mosaic concrete after leaving curing chamber

mined formula which requires that this be done with an exactness of 1/1000th of an inch. All dust is eliminated in this process.

Because it is important that the concrete should fill even the tiniest and sharpest crevice in the mold, the mixture is made highly plastic. Therefore, the surplus water has to be removed before the concrete is allowed to set.



Sectional view of precast unit for mosaic concrete house, showing reinforcement detail

After the cast has been allowed to harden for 12 hours, it is taken out of the mold and its face brushed with wire brushes to remove the surface cement and expose the aggregates. The surface is then given a bath with weak muriatic acid to reveal the full brilliance of the coloring of the slabs. The casts are then cured for 14 days in a curing chamber which maintains an exact humidity and leaves them with a hard, flint-like surface, and a crushing strength of about 5,000 pounds to the square inch.

The precast panels are then assembled on the concrete foundation of the building and anchored into small structural concrete columns cast in place at each joint. The anchoring is done by an engineering device of flexible composition which keeps the slabs from actual union with the concrete columns, but produces a perfectly water-proof joint and at the same time allows for expansion and contraction.

The design of this house belongs to no type of architecture. It was dictated by the characteristics of the material itself, and therefore belongs to no traditional school of architecture. But for its conventional dark slate roof, it might be called modern.

The main color of the building is like that of a pink granite, the result of making the surface of the slabs chiefly out of exposed aggregates of red jasperite, a form of quartz. The corner pilasters and the window trims are made of buff-colored quartz, and the other ornamentations are chiefly of a deep cobalt blue. A polychrome cornice surrounds the entire building, giving an aristocratic setting to an exposed copper gutter. Under the cornice is a blue line about an inch wide to accentuate the shadow of the cornice, and below this a 12-inch mosaic frieze of red and black.

The most striking ornament of the building is a doorway with fluted columns of buff and blue, surmounted by an elliptical slab of carved buff quartz, covering a ceiling lamp, and a buff lintel decorated in a design of red and blue. As a striking innovation, the wooden door has three insets of red and black mosaic concrete.

This idea of carrying mosaic ornamentation into other parts of the structure than the walls is used by making the inside trim

for each window, a band of blue mosaic concrete. A ceiling-high mantel in the living room is another adaptation of the mosaic concrete. It was precast in a single casting—fireplace and all—in a light buff ceramic aggregate, with a border design in red and blue, and a solid black fireback outlined in red.

The house is completely insulated which makes possible the use of the most modern gas heating equipment. It is crowned with a precast chimney—made in one piece—with a mosaic design of red and black.

In some ways as interesting as the house itself, is the completely detached garage. The house was purposely built in the most vivid of colors to reveal the wide range of effects possible. The garage, however, was built with plain unornamented panels to show the effective simplicity of the material itself.

Development of this type of prefabricated house is in the hands of the Earley Process Corp., Washington, D. C. The plant is at Rosslyn, Virginia. John J. Earley is president.

The house has been built for a price which permits it to be sold in competition with the usual type of real estate investment houses.

The material of which the precast walls of the Earley house are made is not new. For 20 years the Earley studios have used it in monumental projects. Something like \$3,000,000 worth of this mosaic concrete has been put into buildings whose aggregate values approximate \$100,000,000—in buildings scattered from New York to Texas.

The development of the material began 20 years ago in the concrete retaining walls of Meridian Hill Park in Washington, D. C. These were originally designed as plain, reinforced concrete walls. The U. S. Fine Arts Commission, however, declined to approve use of an unornamental material, and Mr. Earley was retained to work out a surface finish which would be acceptable.

Development of the use of the pebble



Precast entrance units of mosaic concrete house. The wood door has three insets of concrete mosaic



Garage with unornamented panels

mosaic material was speedily carried into such monumental projects as the duplicate of the Parthenon at Nashville, Tenn., the Louisiana State University at Baton Rouge, and Lorado Taft's famous Fountain of Time at Chicago—the first monumental piece of sculpture of its kind ever to be cast with such material.

In 1932, Mr. Earley was commissioned to cover the dome of the Baha'i Temple at Chicago with a mantle of perforated concrete in a design of lacy network, with a brilliant white surface strong enough to withstand the elements. This presented a novel engineering problem, for the dome of the temple was as large as the dome of the capitol at Washington. Mr. Earley and Basil G. Taylor, the engineer of the Earley studios, solved the problem by casting the segments of the dome in 6-inch slabs of reinforced concrete—the largest being 10 by 12 feet and weighing three and one-half tons.

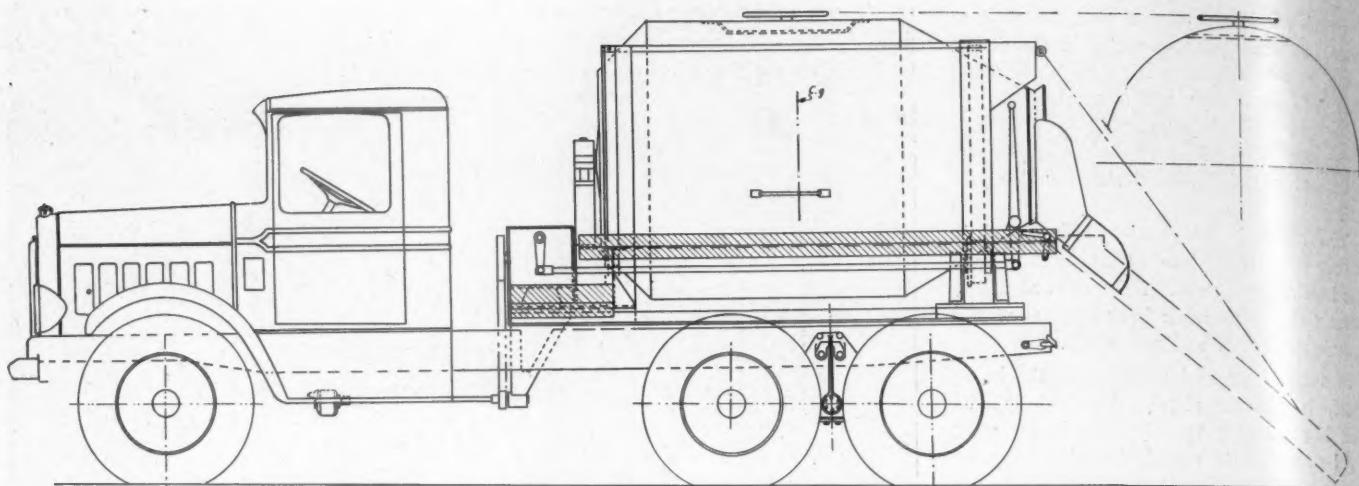


Diagram of revolving-drum, agitator body design specified for 10 new ready-mixed concrete delivery trucks of Warner Co., Philadelphia, Penn.

Warner Company's New Concrete Delivery Trucks

By Irving Warner,

Vice-President, Warner Co., Philadelphia, Penn.

THE WARNER CO., Philadelphia, Penn., probably the largest commercial producer of concrete in the United States, recently added to its concrete transportation equipment by the purchase of 10 new Mack-International trucks, with revolving drum agitator bodies.

Little need be said about the trucks. They are the heavy-duty 6-wheel units with dual drive, having a wheelbase of 136 in.-48 in. The engine is 6-cylinder, 468 cu. in., with 4-speed and reverse transmission. The trucks are also provided with an auxiliary low-gear which gives dual low range on all ratios of the transmission. The rear end is double reduction spur gearing with interaxial power divider.

The trucks have a maximum governed speed of 32 miles per hour. The tires are pneumatic 9.75 in. on 22-in. wheels throughout, with dual wheels on both rear axles.

In the consideration of the type of body to be used, the Warner Co. discovered that there was no standard body on the market which would meet its requirements. For the company firmly adhered to the principles that it had worked out in its long experience in supplying concrete. The concrete must be mixed in a central plant; agitation during transit must be as mild as possible. The body should be driven from the main engine at a speed of only 2 to 3 r.p.m. during transportation, but must go at a suitable discharge speed of 9 r.p.m. According to the company's experience, this combination gives the cheapest and lightest body, the lowest maintenance cost, the greatest reliability, and the best concrete to the customer.

The dual rear introduced an additional complication. The center of gravity had to be located properly with respect to the chassis, and at the same time, the delivery

point had to be sufficiently to the rear to give chute clearance with the wheels on the third axle. The bodies that the Warner Co. has been using and is still using extensively are very satisfactory, except that they are too long and narrow to fill properly when loaded with low-slump concrete. Standard bodies made by the concrete truck body manufacturers were too short to give a proper distance from the center of gravity to the discharge opening.

Accordingly, a collaboration was arranged between the operating and engineering staff of the Warner Co., and the engineers of three of the truck body manufacturers. Blaw-Knox, Jaeger, and Chain Belt, were included in the arrangement, each ultimately getting part of the ten body order.

In this way, the body manufacturers received the benefit of the operating and engineering experience of the Warner Co. in the delivery of some 3,000,000 cu. yd. of concrete for all classes of construction and under all conditions of delivery. The Warner Co. received the benefit of the engineering experience of leading machinery manufacturers. The Warner Co. had certain basic specifications which the body manufacturers had to meet, after which they were permitted to follow their own design and their own standards.

Drive Characteristics

The drive of the drum was to be from the main engine. On account of modern high engine speed and the desired low body speed for agitation during transit, it was necessary to have Mack engineer a special power takeoff to give counter-engine rotation at about 53% of engine speed. The body manufacturers have supplied a gear box, which, at maximum governed engine speed, drives the drum at 3 r.p.m. This will give the desired

2 r.p.m. at normal engine speed in city traffic. When discharging, the gearing rotates the drum in the opposite direction at $4\frac{1}{2}$ times transit speed. This gives the desired 9 r.p.m. for discharge with a moderate engine speed.

A bracket extends below the gear box carrying a countershaft in line with the power takeoff shaft. This countershaft is connected to the body gear box by a light chain drive which constitutes the breaking point in case of any jamming of machinery. The countershaft is connected to the power takeoff shaft by floating shaft with Spicer universals with telescopic end.

The shape of the bodies follows the general practice of the respective companies. Blaw-Knox and Jaeger, who always have taper conical discharge, continued this principle, and simply elongated the body somewhat so as to secure the prescribed distance from center of gravity to discharge opening. Chain Belt does not use the conical discharge end, so accomplished its purpose by making the entire drum slightly taper, the rear end being a smaller diameter than the forward end. This threw the center of gravity forward as desired.

Experience Incorporated in Design

It is the experience of the Warner Co. that the best concrete is secured by a minimum of agitation during transportation—hence the very low speed of 2 r.p.m. In addition, the discharge flights are so designed as to give the least disturbance to the concrete when revolving in the transit direction, but scoop up the concrete vigorously for rapid discharge.

On account of the arrangement of blades, and the low speed, it is believed that the drums do not take over 3 hp. when operating in the transit direction. This is not an



Ready-mixed concrete delivery truck fleet unit. Each of the 10 trucks has a capacity of $4\frac{1}{2}$ yards of stiff concrete

important drag on the 120-hp. truck engine. When discharging, it is estimated that the power requirements may go up to 25 hp. with low slump concrete.

The bodies all have a common cubage of 172 cu. ft., water level full, which easily takes care of $4\frac{1}{2}$ yd. of stiff concrete. Both charge and discharge doors have metal to metal contact on conical seats, making them easy to keep clean and low in maintenance cost.

Considerable difficulty was encountered in getting a form of chute that would clear the rear wheels and give satisfactory delivery for different classes of work. The problem was finally solved by having a small removable chute which is quickly attachable to the fixed discharge chute. This is suitable for deliveries to box, buggies or wheelbarrows. When a longer chute is wanted for delivery to forms or road work, the small chute is quickly detached and the long chute put in place on a swivel which gives discharge at any angle between straight side deliveries on either side.

New Form of Mounting Body

A new form of mounting was used which appears from early experience to be quite satisfactory. Mounting angles were riveted to the chassis frame, the holes being kept close to the neutral axis of the frame section. The body frames are provided with suitable footings to rest upon these angles. A 1-in. rubber filler was used with through bolts between the body and the mounting angles. These bolts are not intended to take any horizontal thrust. For this purpose, suitable clip angles are provided to take thrust both longitudinally and crosswise.

At the forward end, the body is firmly bolted to the chassis only at one end of the mounting; that is, where the load comes on the center trunnion bearing. The front end of the mounting is left slack with a centering bolt only, so that flexure can take place.

In order to demonstrate the efficacy of this

mounting, an artificial mound was built 18 in. high. One side of the truck was run over this mound. The only interference that took place was between the fan of the engine and the radiator housing. The chassis frame distorted successfully without giving undue strain on the body. It is to be noted that this test is the equivalent of a wheel sinking axle deep into a hole in the roadway.

It is stated to be the expectation of the three truck-body manufacturers to develop this design of body as standard equipment for those producers of central mixed concrete who wish the efficiency and economy of this system. In their present form, these new bodies may be used only for pre-mixed concrete. Certain modifications and a change of gearing would be necessary to adapt them to transit mix. For temporary use as transit mix bodies, the chain drive ratio may be changed to give a suitable mix-in-transit speed. Under such conditions, when discharging, the main engine must be throttled to a low speed in order to avoid too fast rotation when the body operates in the discharge direction.

Although these trucks have been operating only a few weeks, the operating results have been very satisfactory.

Phosphate Rock

Columbia, Tenn: The Ruhm Phosphate and Chemical Co., sellers of "Ruhm's Lime Phosphate," as it calls its high-grade, finely-ground phosphate rock, moved its offices back to Mt. Pleasant, from 2300 Willoughby Tower, Chicago, Ill., where it has had an office since May 1, 1929, and where the only office has been since January 1, 1933. The office is now located in the Wheeler Building on the Public Square in Mt. Pleasant, which will hereafter be the headquarters of the selling forces of this organization.

The return of John Ruhm, Jr., president of the company, and Mrs. Ruhm, to their residence of many years, is a source of

great gratification to their host of friends, while the business interests generally welcome the return to its old headquarters of this oldest and largest producer of ground phosphate rock for direct use as such.

While the phosphate rock industry had never been put under an NRA code, largely due to the fact that the greater portion of the industry is controlled by fertilizer manufacturing companies, hope had been indulged that some proper code for the local industry would soon have been worked out. Whether any voluntary action of this kind will now result is not predictable, but the generally improved condition of the market, with various activities in prospect, seems likely to cause increased activity in operations, and, whenever the demand is anything like normal, labor costs become as high above normal wages in this section, as in the passing depression they have been below ordinary NRA requirements.

Several large transactions under way have been postponed, awaiting some definite effect on conditions generally of the recent Supreme Court decision.

Shipments to the fertilizer trade are at the usual low point between sessions, and not much activity in this direction or in shipment to farmers for direct use will be in evidence until July.

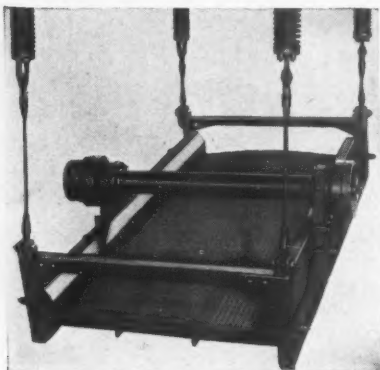
Movement of furnace lump, including TVA shipments, continue at normal rate, and best advantage is being taken of the good weather for outside hand mining.

One of the largest independent plants shipping both ground rock and run of plant, which has been shut down nearly four years, supplying its orders from stock entirely, started up again recently, having entirely cleaned up old stocks, and will probably have continuous operation for rest of the year, preparing the large stocks generally carried by it, regardless of additional orders.

New Machinery and Equipment

Vibrating Screen

ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis., announces a new low-priced single-deck screen of its



Single-deck vibrating screen

"Aero-Vibe" design in all sizes from 1½x3 ft. to 5x10 ft. This type of screen is suspended by cables and springs and is vibrated by adjustable, counter-weighted wheels.

Dragline and Trailer

BUCYRUS-ERIE CO., South Milwaukee, Wis., announces two new products: (Fig. 1) a 5W Bucyrus-Monighan walking dragline and (Fig. 2) a 10-B trailer for carrying the 10-B excavator from job to job.

The new dragline is distinguished by compactness, lightweight, easy-to-ship features, it is claimed. The center section of this machine's revolving frame, with all principal machinery assembled in place, is shipped in one unit in one car. Swing mechanism and fuel-oil tanks are below the deck; and the machine is so balanced that little dead coun-

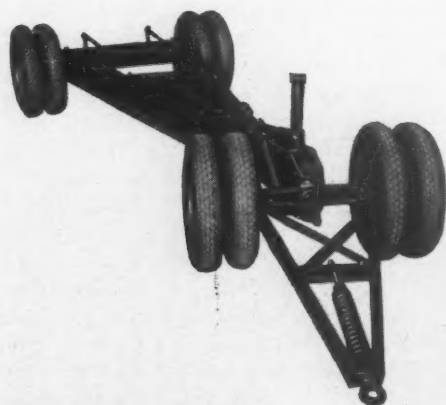


Fig. 2—Trailer for transporting excavator

terweight is required. This, and electric welded construction reduces ground bearing pressure to 4½ lb. per sq. in.

Trailer

To load a 10-B shovel on this pneumatic-tired trailer, the trailer's front axle is disconnected; the shovel is moved over the rear assembly under its own power; the front is raised with a built-in screw jack and the trailer's front axle replaced; the shovel axles are clamped to the trailer frame. The trailer with its load can move, it is claimed, at truck speeds.

Lubrication Data

IN QUARRY car applications, the old type of plain bearings often were lubricated with black oil, called "black strap." Since anti-friction bearings have come into use for this type of service and have replaced plain bearings, O. L. Maag, lubricating engineer for Timken Roller Bearing Co., notes that grease lubrication is essential, and that anti-friction bearings should have their housings filled with medium consistency grease—the lubricant serving as an additional seal to prevent water and dirt from entering the housings.

"In some dry operations, where there are long hauls above ground, the hauls being several miles in length," he continued, "and where the cars are run at high speeds and

down grade, the necessary use of brakes causes high bearing temperatures. For such applications, it is necessary to use a high-melting-point soda soap grease. Ordinarily, the quarry car greases that have proved most successful are lime soap products free from inorganic fillers, compounded from well-refined mineral oils ranging in viscosity from 200 sec. to 600 sec. at 100 deg. F.

Ball Mill Lubrication

"Ball mills, clay mills, etc., represent applications where the service is heavy and the speeds somewhat slow. Usually, heavy cylinder oils are entirely satisfactory for lubricating such applications, although at times it has been found advantageous to use extreme pressure products. By using a lighter-bodied oil (but of the extreme pressure type) it is possible to reduce operating temperatures considerably, and also to show a marked saving in power. At the same time the heavy loads can be carried without harmful effects to the gears or bearings."

Dust Respirators

U.S. BUREAU OF MINES has announced approval of five respirators, in conformity with the requirements set up in Schedule 21 of the Bureau, which establishes a standard procedure for determining the efficiency of respirators in preventing inhalation of dust.

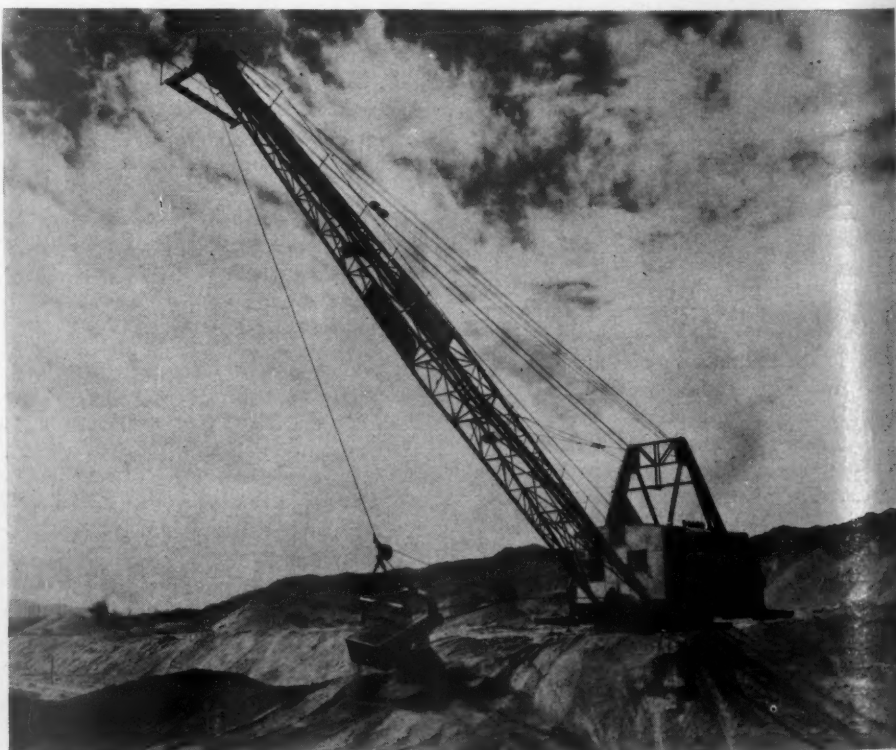


Fig. 1—New walking dragline

The five respirators, with the names of their manufacturers, are:

M. S. A. Comfo Respirator, made by Mine Safety Appliances Co., Pittsburgh, Penn.

Willson Bag Respirator No. 300, made by Willson Products, Inc., Reading, Penn.

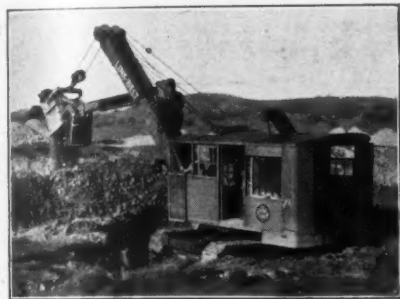
Willson Bag Respirator No. 400, made by Willson Products, Inc., Reading, Penn.

Pulmosan M-15 Respirator, made by Pulmosan Safety Equipment Corp., Brooklyn, N. Y.

Biever Respirator, made by the Standard Safety Equipment Co., 75 East Wacker Drive, Chicago, Ill.

Shovel—Crane—Dragline

LINK-BELT CO., Chicago, Ill., announces two new models of crawler-mounted shovels, cranes, draglines known as

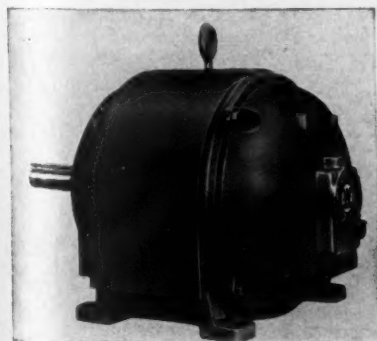


New model shovel-crane-dragline

K-40 and K-45. While basic design is similar to models discontinued, the new machines are said to embody other features to assure maximum ease of operation and maintenance. These machines can be shipped complete on a flat car without dismantling. Improved two-tread steering arrangement and centralized lubricating system and other improvements are features. The shovel sizes are 1¼-cu. yd. and 1½-cu. yd., respectively.

Splash-Proof and Weather-Proof

A SPLASH-PROOF, drip-proof and weather-proof motor for indoor or outdoor use has been announced by the Westinghouse Electric and Mfg. Co., East Pittsburgh, Penn. The motor has been built with

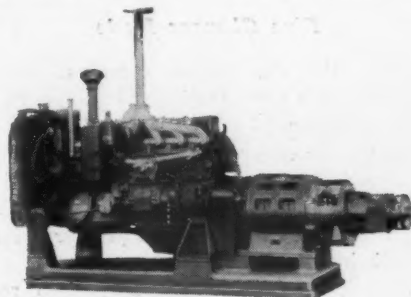


Splash-proof induction motor

the motor frame and end brackets of solid castings for special service where splashing liquids are encountered, and is offered in the squirrel cage and wound rotor types.

Diesel-Engine Generator

HARNISCHFEGGER CORP., Milwaukee, Wis., and Caterpillar Tractor Co., Peoria, Ill., have coöperated to produce a new Diesel-engine generator set; in capacities ranging from 35 to 60 kw. These generator sets are designed for service at mines, quarries, construction camps, etc., for both



Generator set

lighting and power. The standard unit includes engine with all auxiliaries, radiator cooling system, starting engine, auxiliary fuel pump, engine controls to provide proper speed setting and close governing, coupling between engine and generator, flywheel and coupling guard and the generator mounted on the unit base.

Automatic Scale

RICHARDSON SCALE CO., Clifton, N. J., announces a "multiple screw feed" automatic scale for any pulverized material loaded in bags or in bulk. It can be installed for weighing direct from bins, has its own feeder, and is claimed to be surge- or flush-proof. For bagging it weighs a pre-set load in the bag itself. For bulk loading it



Multiple screw feed scale

weighs in a hopper. For both it weighs in a hopper which may terminate either in a flap control door or in a screw conveyor discharge, according to conditions, for delivery in bulk by loading spout or conveyor or into bags. There are five feeder screws, three of which run faster than the other two. The three furnish the "full flow" and deliver the major part of the weighing and stop. The other two supply the "dribble," or reduced flow necessary to complete the load.

Rehandling Grab Bucket

ROBINS CONVEYING BELT CO., New York City, Mead-Morrison Division, announces a new, light, rehandling grab bucket known as type RH. Special shells are an intermediate shape between flat and



Grab bucket with shells of new shape

round, to give the advantages of a flat shell for digging and filling, and a round one for quick discharge. It has a rope reeving without reverse bends and a three-part purchase for rapid opening and closing. The top head is of structural steel with a manganese-steel fairleader bolted in. The hinges are of cast steel of single and double ear construction with large bearings; and all bearings are provided with high-pressure lubrication. The links are of large diameter steel tubing welded to the cast steel ends.

Sinker Drill

CHICAGO PNEUMATIC TOOL CO., New York City, announces CP-22 (dry) and CP-22W (wet) sinker drills



Percussion type sinker drill

(⅞-in. diam.) of the percussion type, the chief characteristics of which are small size, light weight and low air consumption—the weights are 28 and 32 lb., respectively.

Lime Producers' Forum

Conducted by Victor J. Azbe,
Consulting Engineer, St. Louis, Mo.

Changing Kilns from Nineteenth to Twentieth Century

THERE WAS A DAY when satisfactory rejuvenation of either humans or lime plants, when, old was considered an impossible matter. It ordinarily meant getting rid of the old and replacing it with the young or new. Extension of life was possible, of course, but to improve the functions most difficult or impossible.

So when an old plant was seen, of an age from twenty-five to possibly fifty years, it was assumed that the only solution to its future was tearing out and building new. However, lately much of this has changed and one practical example is the Stearns Lime Co. plant at Chicago.

The Stearns Lime Co. is a venerable concern; indeed one would be tempted to say that it built Chicago. The company was in existence some eighty-five years ago, and while the kilns are not that old, their building antedates the memory of those now living.

The kilns of stone with a 16 ft. by 16 ft. base look like medieval forts, more solid and substantial than any similar kilns the writer has ever seen. It is this solidity and sound construction that is responsible for the walls being as good and uncracked as the day they were built. However, internally the dimensions of the shaft, the depth of the cooler, the height of the kiln, all were hopeless as regards making toward efficiency; and what good are sound walls when the hole in the middle, which really constitutes the kiln, is not right?

From Wood to Gas

These kilns for more than a generation were used to burn wood or shavings. Then gas became available, natural gas but not straight; mixed as it is distributed through the Chicago district, but in principle very much the same as straight natural gas. This gas was applied in a fashion—not a very good fashion—just about in the way that wood was burned, and the result of the experiment was failure. Capacity was not much increased, kiln lining was rapidly slagged, and fuel cost per ton of lime, due in part to poor application and inefficient use of gas, and in part due to its high cost, was \$2.27, an impossible figure under the present intensely competitive conditions.

But the management wouldn't give up. They revealed the same quality that carried them through several generations and applied it to carry them through this experiment.

Five Changes Made

First, the old furnace openings were blocked; then new, much smaller openings were made about 4 ft. higher up, which move deepened the cooler.

Second, an arch was installed in the kiln center and gas introduced through the arch.

Third, the thick walls were punctured for poke holes.

Fourth, a small fan was installed to recirculate some CO₂, but with no intention of operating the kiln under suction.

Fifth, the top of the kiln was closed in, in such a way that gas could come out only through a small hole which could be regulated in size.

With the above five changes the operation became radically different. Instead of sealing the draw gates, air was allowed to enter; and the lime drawn, instead of red hot, was cold; the heat formerly wasted was recovered and utilized to pre-heat the air.

With the aid of the arch and poke holes the charge could be hung at will, and kiln trimmed and walls cleaned, and overly hot sections broken up.

Results Accomplished

With the new system of gas introduction the flame was long and luminous and as well distributed as anyone could wish for. It also entered with good velocity, further tending to proper distribution, as contrary to ordinary sluggish flow which tends to stratify. By delayed combustion, as gas had to hunt its air, and by introduction of some CO₂ if it was necessary, the fear for the lining disappeared.

Much also was accomplished by closing in the kiln top. First the stone started pre-heating immediately as everything under the top was filled with hot gases. It had the same effect as if kiln height had been raised.

Ordinarily stone may lie in the storage zone for a half day before it gets into the channel through which hot gases are coming up. Then, also, through this closed top the kiln could be regulated, as it is regulated by means of dampers when equipped with a fan. If demand for lime was low the top would be closed off; if no lime was needed it would be closed off entirely; and if much lime was desired, it was opened up; but never so much that any cold air would pass down into the kiln to cool the pre-heating zone.

And what were the results? First, a much better product, and that is important when one is burning dolomite and striving for neutralizing lime. Then a fuel cost of less than

previously obtained with wood. Then a possible capacity of double and more than that previously obtained. In addition there is a reduction in labor cost that, when there is lime demand, is quite considerable.

But there is still one more item, and that is satisfaction. At a comparatively insignificant expenditure the plant was moved from the Nineteenth to the Twentieth Century. It still looks ancient, but the modern substance infused in the most economical manner is there. One may say that the plant is a path-breaker from the dim past into a more enlightened present, showing the way to others.

Lime Industry News

Strikes have occurred during the last few weeks at isolated lime plants in Alabama, Ohio, Pennsylvania and West Virginia. Demands for closed shop, the check-off system, etc., everywhere demanded, have not been met, and little trouble developed, except in exceptional instances, where outside agitators temporarily won support.

◆ ◆ ◆

Black Marble and Lime Co., Enterprise, Ore., is reported resuming operation after being closed for six years. It has been in receivership of late.

◆ ◆ ◆

Knoxville Lime Manufacturing Co., Knoxville, Tenn., is the new name of the lime operation formerly a part of the Knoxville Sand and Lime Co., which continues to handle the lime as a dealer. The new company is a partnership of E. L. Osborne, Atlanta, Ga., who is president, and W. W. Cowan, formerly with the Knoxville Sand and Lime Co., who is secretary-treasurer and general manager.

Gypsum Industry News

Pacific Portland Cement Co., San Francisco, Calif., has purchased outright the plant and business of the Fernald Co., San Francisco, pioneer manufacturers of corner beads and other metal building specialties widely used on the Pacific Coast. It has also completed negotiations for taking over the distribution in the seven western States of Milcor metal lath and other products of the Milcor Steel Co., Milwaukee, Wis. The Pacific Portland Cement Co. is a large producer and manufacturer of gypsum and gypsum products, as well as portland cement. J. A. McCarthy, vice-president and general manager, has expressed the opinion that the next five years will see an all-time peak in Coast building activity.

THE INDUSTRY

New Incorporations

Southern Sand and Gravel Co., Muskogee, Okla.

Lime Rock Co., Miami, Fla. Incorporators are E. B. Mills and F. G. Murphy, Jr.

Michigan Stone Co., 14100 Welland Ave., Detroit, Mich.; to deal in stone; \$10,000; Edward K. Wasmund.

Brighton Sand Co., Detroit, Mich.; to deal in sand and gravel; J. Fred Smith, 1310 Majestic Bldg., Detroit.

Columbia Asbestos Co., Portland, Ore.; \$5000. Incorporators are M. E. Gotthardt and L. J. Patterson.

Silica Products Co., St. Louis, Mo.; \$200,000. Robert E. Moloney, George T. Priest, 705 Olive St., St. Louis.

The Knightstown Concrete Co., Knightstown, Ind.; reorganization; capital stock, 20 shares of \$100 par value.

North Carolina Feldspar Corp., Erwin, Tenn.; \$100,000. Incorporators are W. F. Deneen and L. L. McIntyre, Jr.

Morris County Sand & Gravel Co., Netcong, N. J.; building materials; 2500 shares, no par value. Agent is H. J. Stehli.

Newark Asphalt Products Co., Newark, Ohio. Incorporators are John M. Ankele, Charles L. Flory and Robert Flory.

Mundy Brothers Quarry, Inc., Roanoke, Va.; to do a quarrying business; maximum capital, \$50,000. Harry G. Mundy is president.

Arrowhead Gravel Co., Watsonville, Calif.; 5000 shares at \$1 each. Directors are John E. Porter, Charles E. Bloom and A. J. Wilson.

The Akron Art Stone, Inc., Akron, Ohio. Holders of the six shares of no par value stock are A. A. Hilkert, H. Kinson and A. P. Botzum.

Bexar Sand and Gravel Co., San Antonio, Texas; quarrying sand and gravel; \$10,000. Incorporators are T. D. Porr, E. V. Biles and James Donaldson.

The Nekoosa Cement, Silo & Brick Co., Nekoosa, Wis.; to deal in cement products; 250 share at \$100 each; W. A. Radke, L. L. Mahlike, James C. Dutton.

J. F. Fitzpatrick, Inc., Auburn, Mass.; sand and gravel; 300 shares no par value. Incorporators are Jane Fitzpatrick, Joseph F. Fitzpatrick and George H. Mason, all of Worcester, Mass.

Lannon Stone Sales Association, Inc., Milwaukee, Wis.; to mine stone and minerals, etc.; 500 shares common stock no par value. Incorporators are C. C. Swallow, Jr., C. A. Starkweather and A. L. Schneider.

San Jose Cement Corp., San Jose, Calif., incorporated in Delaware; to deal in portland cement and all kinds of natural and other cements, lime, etc.; \$10,000,000; J. Vernon Pimm, Albert G. Bauer, Philadelphia, Penn.

Clemente Bros. Sand & Gravel, Inc., Troy, N. Y.; to deal in sand and gravel; \$5000, divided into 50 shares at \$100 each. Directors are Salvatore Clemente, Mary Clemente and Carmine Clemente, 323 Hoosick St., Troy.

Chillicothe Gravel Co., East Lane, East Peoria, Ill.; to manufacture, refine, and sell siliceous sand, gravel and other products; 500 shares no par value common. Incorporators are John Gibbons, Fern Gibbons and Thomas W. Gibbons.

E. T. Slider, Inc., 210 Market St., New Albany, Ind.; to engage in sand and gravel business; 4000 shares no par value; Edward T. Slider, Chester C. Slider, Clarence N. Slider, Walter L. Slider, Osborne G. Reilly and Charles D. Kelso.

Capitol Concrete Products, Inc., Albany, N. Y.; contracting business and dealer in sand, stone and gravel; \$100,000. Incorporators are George E. Smith, 25 Barclay St., Albany; Charles W. Maxwell, Wingerlands, N. Y.; Richard Hopkins, Troy, N. Y.

Lensch Sand & Gravel Corp., Babylon, N. Y., is a consolidation of Lensch Sand & Gravel Corp., Frank J. Lensch Trucking Corp., and Lensch Concrete Products Co.; \$25,000. Incorporators are Frank J. Lensch, Julius Lensch and Marguerite L. Lensch.

Colonial Art Stone Corp., Yonkers, N. Y.; building materials; 900 shares, no par value. Incorporators are Louis Guzzetti, 181 Park Ave., Tuckahoe, N. Y.; Ricardo Introlini, 15 Franklin St., Tuckahoe, N. Y.; and Norman R. Greathouse, 226 W. 50th St., New York City.

Anna Corp., 140 S. Dearborn St., Chicago, Ill.; to dig, mine, store, market, buy, sell, manufacture kaolin, silica, mica, manganese; 1500 shares par value common and 250 shares par value preferred. Incorporators are Arthur A. Basse, William Basse and A. G. Hansen.

Feldspar Producing Co., Penland, N. C.; to mine, manufacture, treat and refine feldspar, mica, kaolin and all other minerals; authorized capital stock \$100,000, subscribed stock \$300, by W. F. Deneen, Johnson City, Tenn., L. L. McIntyre, Jr., Erwin, Tenn., and W. B. Dean, Bakersville, N. C.

Personals

Frank McElroy, former superintendent of National Lime & Stone Co., Bluffton, Ohio, is supervising construction of a new factory being built by Triplett Electrical Instrument Co., Bluffton.

H. H. Boomer, superintendent of the stockton, Calif., plant of Santa Cruz Portland Cement Co., explained the system of cement transportation through tubes in a recent talk before members of the local Lions' Club.

W. A. McCannless, manager, Yosemite Portland Cement Co., showed two reels of motion pictures at a Kiwanis club luncheon recently at Merced, Calif., depicting operations of the company at the quarry and at the local plant.

E. M. Confer, former general superintendent of the Alabama Lime & Stone Corp., Calera, Ala., has been appointed superintendent of Muscle Shoals White Lime Co., general offices at Sheffield, Ala., and plant at Denle, Ala.

Lamont du Pont, president of E. I. du Pont de Nemours & Co., Wilmington, Del., recently discussed the development of waterproof cellophane and its market as well as other phases of chemical development before the American Chemical Society.

W. M. McConnell has joined the engineering department of the Patterson Foundry & Machine Co., East Liverpool, Ohio, to take charge of the drafting room. He was formerly with the Koppers Co. and the American Cyanamid & Chemical Corp.

Walter B. Lenhart, former associate editor of ROCK PRODUCTS, is now mill superintendent of the Backbone Gold Mining Co., Kennet, Shasta county, Calif. Mr. Lenhart was promoted to the position of mill superintendent after having served briefly as assayer and metallurgist of the company.

Dr. Irving Langmuir, associate director of the General Electric Research Laboratory, was awarded the Holley Medal for 1934 at the semi-annual meeting of the American Society of Mechanical Engineers at Cincinnati, Ohio, June 20. The Holley Medal, instituted in 1924 to promote engineering genius, was awarded to Hjalmar Gotfried Carlson in 1924; to Elmer Ambrose Sperry in 1928; and to Baron Chuzaburo Shiba in 1929.

Obituaries

H. Miscampbell, Duluth, Minn., former manufacturer of Clyde lime hydrators, died June 3.

Burney L. Cox, 73, president of the Cement Products Co., died at his home in Birmingham, Ala., May 22.

Justin W. Hough, 35, superintendent of the Metropolitan Concrete Co., died suddenly at his home in Cleveland, Ohio, June 24.

Harry R. Welch, 58, died of a heart attack June 21 at Columbus, Ohio. For 17 years he was superintendent of the Marble Cliff quarries.

Hartford B. Goddard, 58, died May 12 at Marietta, Ohio. He was president of the Marietta Concrete Corp., with plants at Marietta, Ohio, and Jersey City, N. J.

John P. Jones, 88, for thirty years a member of the firm of Shoup and Jones, cement block manufacturers, died at his home in Lincoln, Ill., June 17, after a seven weeks' illness.

Franklin Brodix, 66, president of the Monon Stone Co., Bloomington, Ind., died of heart disease at his home May 25 following an illness of several weeks. He had been active in the stone industry for 45 years.

John O. Bainter, 38, gravel pit operator, was found crushed to death beneath a truck in the garage of his home near Goshen, Ind., June 3. His skull was crushed when the dump body of the truck fell as he was working underneath.

A. J. Maloney, 51, died following a heart attack May 21 at his home in Merion, Penn., after illness of several months. He was head of the Philadelphia-Reading Coal and Iron Co. Mr. Maloney began working at the age of 11, and, in his student days, took a position as traffic manager of the Whitehall Portland Cement Co., and studied coal mining by correspondence.

Norman Henry, 46, of Steubenville, W. Va., was killed May 24 at the Standard Slag Co.'s recently completed plant in North Benwood, W. Va., when a crane upset a large coal bin and he was caught between the bin and a car just being moved into the plant. He was an inspector and chief mechanic in installation of slag plants and had been at North Benwood for several days.

Quarries

Canadian Rock Products, Ltd., has moved its executive offices to 1024 Price House, Quebec.

C. J. Putnam has leased the Schroeder quarry west of Davenport, Iowa, and has started operation.

The Elk township (Kan.) board has purchased a new 9x16 jaw-type rock crusher. Farmers have offered to donate rock.

The Kreuger quarry on highway "MM" near La Crosse, Wis., is being operated by 40 men as a WERA highway project.

Cass county (Neb.) commissioners have purchased a rock crusher for the Roca quarry. Heretofore they used leased machinery.

Worth county, Mo., has installed a rock crusher at the Fry quarry near Allendale to supply material for resurfacing Grant City streets.

The Pleasant Hill (Mo.) city-township crushing plant is being worked by federal relief labor to produce rock for surfacing 11 city blocks.

The Marquette (Mich.) city quarry, near Harvey, was opened in June to produce stone for filling holes in streets torn up in a storm sewer project.

Quincy Mass., through Acting Mayor Leo E. Mullin, has announced its intention of establishing a city stone-crushing plant, operated by ERA labor.

Dodge county, Minn., has awarded a contract for a new 15x36-in. rock crusher to William H. Ziegler Co., Inc., Minneapolis, Minn., whose bid was \$5235.

D. K. Williams, South Centerville, Kan., has a rock crusher located on his farm south of town and is furnishing lime and crushed rock for a new school building.

The crusher-trailer being operated on the road from Pleasant Hill towards Willowtown, near Campbellsville, Ky., is reported to be handling 250 cu. yd. of rock per day.

Osage and Douglass county (Kan.) labor is being employed for crushing rock for Highway 50. The DeSoto rock crusher has been moved to the Henry Desque farm.

Relief labor was employed in stripping two quarries in Marion and Sandusky townships, pending receipt by Lee county, Iowa, of stone quarry machinery allotted by federal relief.

Mahaska county (Iowa) supervisors recently leased land on the Jacob Dahm farm two miles south of Peoria for a rock quarry and received bids for stripping 10,000 cu. yd. of earth.

The Lima, Ohio, city council is negotiating for the lease of 2 acres of land on which rock quarrying operations may be carried out, as the present source of supply is nearly exhausted.

The Interstate Construction Co., Madison, Wis., which has the contract for improving Highway 22 through Riverside, has been operating a quarry on the Edward Wiegler farm southwest of Riverside.

The Tama county (Iowa) board of supervisors has secured a large consignment of stone from the O. J. Smith estate quarry at Mooreville. The material, of high quality, is being used on highway projects.

Middlesboro, Ky., has arranged with federal relief officials to lease the limestone quarry on the Cumberland Mountain for a month for the securing of limestone to repair unpaved roads and streets. The output is 100 tons a day.

A farmer of Mahaska county, Iowa, Guffy Johnson, has brought suit against Eldert Groenendyke, operator of an adjoining rock quarry, to enjoin him from blasting. He seeks \$1000 damages for alleged injury and death of livestock and other inconveniences.

Hyman Spiteaufsky, Kansas City, Mo., has applied for a change in the zoning law to permit temporary operation of a stone quarry

at 47th St., between Jackson and Elmwood Ave. Home owners are opposed to the quarry because of the noise from blasting.

The Cady quarry, Keota, Iowa, has been reopened for commercial purposes after an abandonment of 40 years. E. D. Wall, of Vinton, who has a contract for surfacing Highway 22 west from Wellman, installed the quarrying equipment and started operation.

Capacity of the Lyon county (Kan.) rock crusher at the R. Pierson farm, 6 miles northeast of Admire, was increased 20 cu. yd. a day recently by the installation of a new screen, according to O. D. Henry, county engineer. Its output is now about 150 cu. yd. daily.

The Madison county (Iowa) board of supervisors has been informed that all PWA work must be done by the contract system, relief labor working under the direction of the contractors, and the board merely specifying on what secondary roads the rock is to be spread. It will buy no crushers.

Madison county, Iowa, has taken an option on the exposure of Bethany rock at Jackson's, south of Earlham, where the bed of rock is 20 to 24 ft. thick. As soon as federal aid is allotted, a crusher outfit will be purchased and the road from Earlham to No. 2 west of Winterset will be surfaced.

Buchanan county, Iowa, which was allotted \$1300 by the Iowa emergency relief administration for purchasing rock quarries and crushing rock, has selected one quarry near Pine creek on the Thomas Robinson farm and another near Fairbank. It has been operating a quarry near Aurora since last fall.

Sand and Gravel

The Phoenix Sand and Gravel Co. plant at St. Louis, Mo., has been dismantled and removed.

Ramsey county commissioners at St. Paul, Minn., recently purchased a portable gravel, screening and crushing plant from the William Ziegler Co., for \$9118.

Hersey Gravel Co. plant, Hersey, Mich., is reported running at full capacity, loading 30 cars daily for the first time in four years.

Cement

Signal Mountain Portland Cement Co., Chattanooga, Tenn., resumed operation early in June. Two kilns are operating.

Cowan Portland Cement Co., Cowan, Tenn., reopened May 19. The plant has been closed since early in February, undergoing improvements which will cut the cost of operation.

The Lone Star Cement Co., Kansas, Bonner Springs plant, was shut down in June. Several men were retained at the quarry, and repairs were carried on at the plant. Shipments from stock continue.

Lime

The Wheelbarger-Rumsey Lime Corp., Ottobine, Va., was closed in June after being in operation for several weeks. Several hundred tons of lime are in storage.

Cement Products

Ace Cast Stone Co., Inc., 1443 East Commerce St., New York, N. Y., recently filed a voluntary petition in bankruptcy, listing liabilities of \$9019 and assets of \$8089.

Bamberg county, S. C., has erected a concrete piping plant at Bamberg and is manufacturing concrete pipe in sizes of 15 to 36 in. for culverts. Convict labor is employed.

Anderson county, S. C., has completed a new concrete plant on county home property and is producing concrete pipe for culverts. Convicts are being taught to operate the plant.

Agricultural Limestone

A limestone pulverizing project has been undertaken at St. Charles, Minn.

Two crushers have been operating since April 1 at Mower county, Minn., crushing limestone for farmers. SERA labor is used.

Whitfield county, Ga., is planning to secure machinery for grinding county limestone, which FERA assays show to be 95 to 98% lime.

Boone county, Ky., has been allotted \$4320 by the Kentucky Emergency Relief Admin-

istration for pulverizing limestone, a project which employs 19 men.

Plans for a limestone quarrying project in Gallia county, Ohio, to be performed by FERA labor, have been submitted for approval to the Ohio relief commission.

Randolph county, W. Va., is producing crushed limestone for sale at a nominal price to farmers. The crusher has been set up on the Frank Ward farm above Huttonsville.

Manufacturers

Productive Equipment Corp., Chicago, Ill., announces the new location of its Michigan representatives, Eddy & Cuthbert, at 709 S. Washington Ave., Lansing, Mich.

Babcock & Wilcox Co. will remove all divisions now at 130 Cedar St., New York City, to 19 Rector St., on July 8. The general offices of the company will continue at 85 Liberty St.

Stephens-Adamson Mfg. Co., Aurora, Ill., announces the appointment of L. R. Veatch to handle sales and engineering of their Redler conveyors in Buffalo, N. Y., and surrounding territory.

Pangborn Corp., Hagerstown, Md., announces the election of P. J. Potter, former second vice-president, as a director and vice-president. He will be responsible for engineering, sales and production. Announcement is also made of the promotion of Victor F. Stine to sales manager. Mr. Stine was recently elected second vice-president.

A. P. Green Fire Brick Co., Mexico, Mo., is celebrating its silver anniversary. A. P. Green, founder and active head of the company, was awarded an honorary degree of doctor of engineering at the recent commencement exercises of the Missouri School of Mines.

United States Rubber Products, Inc., Mechanical Goods Division, New York, N. Y., announces that its New Orleans branch has been moved from 202 Fulton St. to 440 Canal St. It also announces that W. S. Long, formerly manager of mechanical sales in Seattle, has been transferred to the Los Angeles district, and C. W. Gilmer, formerly salesman in the San Francisco district, has been made mechanical sales manager at Seattle.

SHALER SHAKER

Simple, sturdy and efficient drive for imparting an oscillating movement to screens, conveyors and agitators. A self-contained unit that positively cuts down power cost, reduces wear and tear on housing equipment and is a real factor in maintaining uniformity and quality of product.

NOTE THESE 12 DESIRABLE CHARACTERISTICS:

1. The unit is dust-proof, oil-proof and fire-proof.
2. Maintenance cost practically nil.
3. Weight members are segmental in form and as they operate in a dust-proof enclosure, dirt and grease cannot collect opposite the weights to reduce their effectiveness.
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7. Ball bearings throughout.
8. Inner bearings are full floating—no end-thrust loading.
9. Gear housing and inner bearing support member is cast integral with central frame portion, thus assuring true alignment of gears and driving shafts.
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11. Gears and driving shafts are machined from one piece S.A.E. 2315 steel, heat treated and ground.
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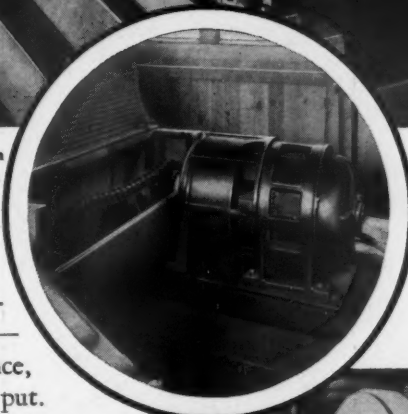
FROM QUARRY TO CONSTRUCTION JOB YOU CAN PROFIT WITH G-E EQUIPMENT



G-E Thrustors give efficient service in opening and closing valves, doors, and gates, and in operating levers. The one shown is serving as a valve operator in a rock-products plant



G-E wound-rotor induction motor driving a kiln — a smooth-operating, economical, long-lived power unit



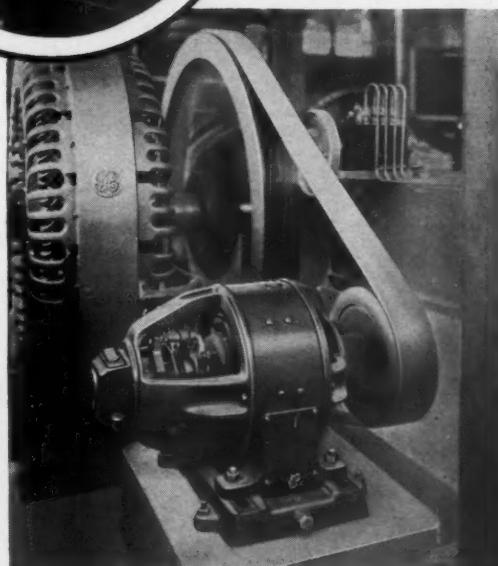
G-E gear-motor of the single-reduction type driving a cold Amesite mixer. A low-cost power unit, adapted to many purposes

DO you need new drive units? General Electric can furnish them in all standard and in many special types—units that offer low-cost operation, negligible maintenance, and efficient adaptability to whatever use they may be put. Squirrel-cage and wound-rotor induction motors, d-c. and synchronous motors—all are designed to help you cut plant operating costs. These motors are available not only in open types, but also in splashproof and totally enclosed, dust-tight construction.

Your control equipment—do you feel that it is obsolete or inefficient? General Electric offers a complete line of protected control which can aid you in solving your problem. Automatic devices, cable, switchgear, also control equipment of a special nature if needed, can be supplied in this line.

Other electric requirements—generators for steam, hydroelectric, or Diesel-electric prime movers; transformers; power and instrument Selsyns; Thrustors; power-factor-corrective equipment; and plant-lighting apparatus are all available in efficient, long-lived units that return substantial savings by their low operating cost, low maintenance, and easy adaptability.

For information concerning General Electric's complete line of electric equipment for the rock-products industry, write to the G-E sales office nearest you, or to General Electric Company, Schenectady, New York.



G-E synchronous motor driving an air compressor in a cement mill. This drive is highly efficient. It effects substantial yearly savings in power costs

GENERAL ELECTRIC

011-69

Classified Directory of Advertisers in this Issue of Rock Products

For alphabetical index, see page 2

This classified directory of advertisers in this issue is published as an aid to the reader. Every care is taken to make it accurate, but ROCK PRODUCTS assumes no responsibility for errors or omissions. The publishers will appreciate receiving notice of omissions or errors, or suggestions.

Abrasive Wheels
Manhattan Rubber Mfg. Div.
of Raybestos - Manhattan,
Inc.

Acetylene Welding Rod
American Steel & Wire Co.

**Agitators, Thickeners and Slurry
Mixers**
F. L. Smidth & Co.

Air Compressors
Fuller Co.
Nordberg Mfg. Co.
Traylor Eng. & Mfg. Co.
Worthington Pump & Machy.
Corp.

Air Filters
Fuller Co.

Air Separators
Bradley Pulverizer Co.
Raymond Bros. Impact Pulv.
Co.

Anti-Freeze Solution
Firestone Tire & Rubber Co.

Babbitt Metal
Joseph T. Ryerson & Son, Inc.

Backdiggers
Lima Locomotive Works, Inc.
(Ohio Power Shovel Co.)

Backfillers
Austin-Western Road Machy.
Co.
Bucyrus-Erie Company
Harnischfeger Corp.
Lima Locomotive Works, Inc.
(Ohio Power Shovel Co.)

**Balls (Grinding, See Grinding
Balls)**

Balls (Tube Mill, etc.)
Allis-Chalmers Mfg. Co.
Lorain Steel Co.
F. L. Smidth & Co.

Bar Benders and Cutters
Koehring Co., Division of National
Equipment Corp.

Batchers
Fuller Company

Batteries
Firestone Tire & Rubber Co.

Bearings
Link-Belt Co.
Joseph T. Ryerson & Son, Inc.
Timken Roller Bearing Co.

Bearings (Anti-Friction)
Timken Roller Bearing Co.

Bearings (Roller)
Timken Roller Bearing Co.

Bearings (Tapered Roller)
Timken Roller Bearing Co.

Bearings (Thrust)
Timken Roller Bearing Co.

**Belting (Elevator and Con-
veyor)**
Manhattan Rubber Mfg. Div.
of Raybestos - Manhattan,
Inc.
Robins Conveying Belt Co.
United States Rubber Co.

Belting (Transmission)
Manhattan Rubber Mfg. Div.
of Raybestos - Manhattan,
Inc.

Belts (Fan)
Firestone Tire & Rubber Co.

Belting (V Type)
Manhattan Rubber Mfg. Div.
of Raybestos - Manhattan,
Inc.

Bin Gates
Fuller Co.
Industrial Brownhoist Corp.
Link-Belt Co.
Traylor Eng. & Mfg. Co.

Bins
Austin-Western Road Machy.
Co.
Traylor Eng. & Mfg. Co.

Blasting Machines
Atlas Powder Co.

**Blasting Powder (See Powder,
Blasting)**

Blasting Supplies
Atlas Powder Co.

Blocks (Pillow, Roller Bearing)
Link-Belt Co.
Timken Roller Bearing Co.

Boilers
Babcock & Wilcox Co.
Combustion Engineering Corp.

Boots and Shoes
United States Rubber Co.

Brake Lining (Asbestos)
Firestone Tire & Rubber Co.
Manhattan Rubber Mfg. Div.
of Raybestos - Manhattan,
Inc.

Breakers (Primary)
Smith Engineering Works
Williams Patent Crusher &
Pulv. Co.

**Buckets (Clamshell, Grab,
Orange Peel, etc.)**
Harnischfeger Corp.
Hayward Company
Industrial Brownhoist Corp.
Link-Belt Co.
Wellman Engineering Co.

**Buckets (Dragline and Slack-
line)**
Bucyrus-Erie Co.
Wellman Engineering Co.

**Buckets (Dredging and Exca-
vating)**
Harnischfeger Corp.

**Buckets (Elevator and Con-
veyor)**
Cross Engineering Co.
Hendrick Mfg. Co.
Industrial Brownhoist Corp.
Link-Belt Co.

Bulldozers
Koehring Co., Division of National
Equipment Corp.

Cableways
American Steel & Wire Co.
General Electric Co.
Link-Belt Co.
Macwhyte Company
John A. Roebling's Sons Co.
Williamsport Wire Rope Co.

Calcining Kettles (Gypsum)
J. B. Ehrsam & Sons Mfg.
Co.

Cap Crimpers and Fuse Cutters
Ensign-Bickford Co.

Caps (Blasting)
Atlas Powder Co.

Car Pullers
Link-Belt Co.

Carriers
Barber-Greene Co.

Cars (Dump)
Lorain Steel Co.

Cars (Quarry and Gravel Pit)
Austin-Western Road Machy.
Co.
Lorain Steel Co.

Castings
Babcock & Wilcox Co.
Eagle Iron Works (Grey Iron)
Link-Belt Co.
Timken Roller Bearing Co.

Cement Making Machinery
F. L. Smidth & Co.

Cement Process
Cement Process Corp.

Cement Pumps
Fuller Co.
F. L. Smidth & Co.

**Chain (Dredge and Steam
Shovel)**
Bucyrus-Erie Co.

**Chain (Elevating and Convey-
ing)**
Chain Belt Co.
Link-Belt Co.

Chain Drives
Chain Belt Co.

Chain Systems (Kilns)
F. L. Smidth & Co.

Chute Lining
Manhattan Rubber Mfg. Div.
of Raybestos - Manhattan,
Inc.

Chutes and Chute Liners
Cross Engineering Co.

Classifiers
Link-Belt Co.

Clay Working Machinery
Bonnot Company

Clips (Wire Rope)
American Steel & Wire Co.
Macwhyte Company
Williamsport Wire Rope Co.

Coal Crushers and Rolls
Austin-Western Road Machy.
Co.
Williams Patent Crusher &
Pulv. Co.

Coal Pulverizing Equipment
Babcock & Wilcox Co.
Bonnot Company
Bradley Pulverizer Co.
Pennsylvania Crusher Co.
Raymond Bros. Impact Pulv.
Co.
F. L. Smidth & Co.
Williams Patent Crusher &
Pulv. Co.

**Compressors (See Air Com-
pressors)**

**Concrete Slab Raising Equip-
ment (Mud-Jack)**

Koehring Co., Division of
National Equipment Corp.

Conveyor Idlers and Rolls
Barber-Greene Co.
Link-Belt Co.

Conveyors and Elevators
Earle C. Bacon, Inc.
Barber-Greene Co.
Fuller Company
Industrial Brownhoist Corp.
Lewistown Fdy. & Mach. Co.
Link-Belt Co.
Robins Conveying Belt Co.
F. L. Smidth & Co.
Smith Engineering Works
Traylor Eng. & Mfg. Co.

Conveyors (Pneumatic)
Fuller Company

Conveyors (Screw)
Link-Belt Co.

**Coolers (See Kilns and Coolers,
Rotary)**

Correcting Basins
F. L. Smidth & Co.

Couplings (Flexible and Shaft)
Link-Belt Co.

Couplings (Hose, Pipe, etc.)
United States Rubber Co.

Cranes (Clamshell)
Austin-Western Road Machy.
Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Koehring Co., Division of
National Equipmt. Corp.

**Cranes (Crawler and Locomo-
tive)**
Austin-Western Road Machy.
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Bucyrus-Erie Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Koehring Co., Division of
National Equipmt. Corp.
Lima Locomotive Works, Inc.
(Ohio Power Shovel Co.)
Link-Belt Co.

Cranes (Excavator)
Koehring Co., Division of
National Equipmt. Corp.

**Cranes (Overhead Traveling
Electric)**
Harnischfeger Corp.
Industrial Brownhoist Corp.

Crusher Parts
Pennsylvania Crusher Co.

Crushers (Hammer)

Austin-Western Road Machy.
Co.
Dixie Machy. Mfg. Co.
Lorain Steel Co.
Pennsylvania Crusher Co.
Williams Patent Crusher &
Pulv. Co.

"GULF LUBRICANTS ...A MAJOR FACTOR IN EMPLOYEE *Safety*"

PENNSYLVANIA DIXIE CEMENT CORPORATION
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Gears and bearings of this 175 ft. rotary kiln are protected with Gulf lubricants which minimize wear and repair expenses.

The use of Gulf oil in their circulating systems is an important factor in keeping the 3 turbines in the Penn Dixie power plant continuously "on the line."



"The Uniform High Quality of Gulf Products has brought us **REAL ECONOMIES***"*

THAT is the statement made by the management of the Penn Dixie Cement Corporation, after six years' experience with Gulf quality lubricants and engineering service.

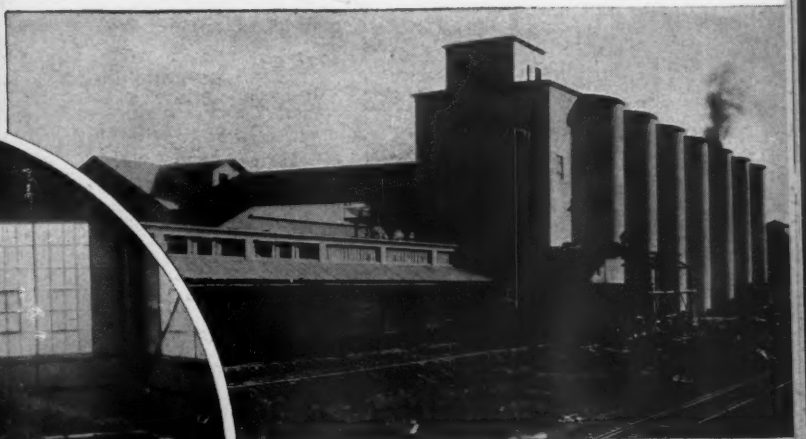
This plant won a safety award in 1933 for its perfect safety record. The efficient use of Gulf lubricants has been an important factor in maintaining safe working conditions throughout the plant.

Many leading plants in the rock products industry are standardizing on Gulf lubricants for the economies and improvements in plant operation which result from their use. A Gulf engineer can be of real assistance to you in setting up improved lubrication practice throughout your plant. We suggest that you set aside a time to discuss this matter in detail with a Gulf representative.

GULF REFINING COMPANY, Pittsburgh, Pa.

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This brief treatise has been prepared to help executives in the rock product industries analyze and reduce their lubrication and maintenance costs. Your copy is ready.



One of the Compeb mills with conical bin and feed table in the raw grinding department in the Penn Dixie Cement plant.



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3800 Gulf Building, Pittsburgh, Pa.

Please send me without obligation, the booklet "Lubrication Cost Recording."

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Company.....

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Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 2

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Earle C. Bacon, Inc. (Jaw)
Good Roads Machy. Corp.
(Jaw)
Lewistown Fdy. & Mach. Co.
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Pennsylvania Crusher Co.
Smith Engineering Works
Traylor Eng. & Mfg. Co.

Crushers (Reduction)
Bonnot Company

Crushers (Rotary)
J. B. Ehrsam & Sons Mfg.
Co.

Crushers (Single Roll)
Austin-Western Road Machy.
Co.
Link-Belt Co.
McLanahan & Stone Corp.
Pennsylvania Crusher Co.

Crushing Rolls
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
Traylor Eng. & Mfg. Co.

Derricks and Derrick Fittings
Harnischfeger Corp.

Detonators
Atlas Powder Co.

Diaphragms (Pump)
Manhattan Rubber Mfg. Div.
of Raybestos - Manhattan,
Inc.
United States Rubber Co.

**Dippers and Teeth (Steam
Shovel)**
Bucyrus-Erie Co.
The Frog, Switch & Mfg. Co.

Dirt Moving Equipmt. (Dumpton)
Koehring Co., Division of
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Ditchers
Barber-Greene Co.
Bucyrus-Erie Co.
Harnischfeger Corp.

Draglines
Bucyrus-Erie Co.
Harnischfeger Corp.
Link-Belt Co.

Draglines (Gasoline or Electric)
Koehring Co., Division of
National Equipmt. Corp.

Dragline Excavators
Austin-Western Road Machy.
Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Lima Locomotive Works, Inc.
(Ohio Power Shovel Co.)

Dragline Cableway Excavators
Bucyrus-Erie Co.
Link-Belt Co.
Sauerman Bros.

Dragline Excavators (Walking)
Bucyrus-Monighan Company

**Dredge Pumps (See Pumps,
Dredging)**

Dredges
Bucyrus-Erie Co.
Hayward Co.
Morris Machine Works

Dredging Sleeves
Manhattan Rubber Mfg. Div.
of Raybestos - Manhattan,
Inc.
United States Rubber Co.

Drill Bits
Timken Roller Bearing Co.

Drills
Bucyrus-Erie Co.
Timken Roller Bearing Co.

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Ajax Flexible Coupling Co.

Drives (Short Center)
Allis-Chalmers Mfg. Co.

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Allis-Chalmers Mfg. Co.
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Bonnot Company
Combustion Engineering Corp.
Hardinge Company, Inc.
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Fuller Company

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John A. Roebling's Sons Co.

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Nordberg Mfg. Co.

Electric Power Equipment
Allis-Chalmers Mfg. Co.
General Electric Co.

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Bonnot Company
Productive Equipment Corp.
F. L. Smidth & Co.

Engines (Diesel)
Nordberg Mfg. Co.

Engines (Steam)
Morris Machine Works

**Excavating Machinery (See
Shovels, Cranes, Buckets,
etc.)**

Excavators (Crawling Tractor)
Koehring Co., Division of
National Equipmt. Corp.

Excavators (Dragline)
Koehring Co., Division of
National Equipmt. Corp.

Explosives
Atlas Powder Co.

Fans
General Electric Co.

Feeders
Babcock & Wilcox Co. (Pul-
verized Coal)
Fuller Co. (Cement and Pul-
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Hardinge Company, Inc.
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Furnaces
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Fuses (Detonating and Safety)
Ensign-Bickford Co.

Fuses (Electrical)
General Electric Co.

Gaskets
Manhattan Rubber Mfg. Div.
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United States Rubber Co.

Gasoline
Texas Company

Gears and Pinions
General Electric Co.
Link-Belt Co.

**Gelatin and Semi-Gelatin (See
Explosives)**

Grapples (Stone)
Hayward Co.

Grease
Gulf Refining Co.
Texas Company

Grinding Balls
Babcock & Wilcox Co.
Lorain Steel Co.

Grizzlies
Productive Equipment Corp.
Robins Conveying Belt Co.
Smith Engineering Works
Traylor Eng. & Mfg. Co.

Grizzly Feeders
Traylor Eng. & Mfg. Co.

Hammer Mills (See Crushers)

Hoists
Harnischfeger Corp.
Link-Belt Co.

**Hose (Water, Steam, Air Drill,
Pneumatic, Sand Suction
and Discharge)**

Firestone Tire & Rubber Co.
Manhattan Rubber Mfg. Div.
of Raybestos - Manhattan,
Inc.
United States Rubber Co.

Insulation (Electric)
General Electric Co.

Kilns and Coolers (Rotary)
Allis-Chalmers Mfg. Co.
Bonnot Company
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.
Kominuters (See Mills)

**Lighters, Hot Wire (For Safety
Fuse)**

Ensign-Bickford Co.

Lime Handling Equipment
Fuller Company
Link-Belt Co.
Raymond Bros. Impact Pulv.
Co.

**Lime Kilns (See Kilns and
Coolers, Rotary)**

**Linings (Iron for Ball and Tube
Mills). See Mill Liners)**

**Linings (Rubber for Ball and
Tube Mills)**
Manhattan Rubber Mfg. Div.
of Raybestos - Manhattan,
Inc.
United States Rubber Co.

Loaders and Unloaders
Barber-Greene Co.
Bucyrus-Erie Co.
Fuller Company
Link-Belt Co.

**Locomotive Cranes (See Cranes,
Crawler and Locomotive)**

Locomotives (Diesel)
The Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Diesel-Electric)
The Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Gas Electric)
The Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Oil Electric)
The Fate-Root-Heath Co.
Plymouth Locomotive Works

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Plymouth Locomotive Works
(Gas)

Locomotives (Storage Battery)
General Electric Co.

Log Washer
McLanahan & Stone Corp.
Smith Engineering Works

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American Steel & Wire Co.
(Wire Rope)
Gulf Refining Co.
Macwhythe Co. (Wire Rope)
Texas Company

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Harrington & King Perforat-
ing Co.

Magnets
General Electric Co.

Manganese Steel Castings
The Frog, Switch & Mfg. Co.

Mechanical Rubber Goods
Firestone Tire & Rubber Co.
Manhattan Rubber Mfg. Div.
of Raybestos - Manhattan,
Inc.
United States Rubber Co.

**Mill Liners and Linings (Iron
for Ball and Tube Mills)**
Babcock & Wilcox Co.
Lorain Steel Co.
F. L. Smidth & Co.

**Mills, Grinding (Ball, Tube,
etc.) (See also Crushers,
Hammer)**
Allis-Chalmers Mfg. Co.
Bonnot Company
Bradley Pulverizer Co.
Raymond Bros. Impact Pulv.
Co.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.
Williams Patent Crusher &
Pulv. Co.

Mixers (Concrete)
Koehring Co., Division of
National Equipmt. Corp.

**Motors and Generators (Electric
Units)**
Allis-Chalmers Mfg. Co.
General Electric Co.
Harnischfeger Corp.

Oil Burners
Babcock & Wilcox Co.

Oils (Lubricating)
Gulf Refining Co.
Texas Company

Packings (Pump, Valve, etc.)
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of Raybestos - Manhattan,
Inc.
United States Rubber Co.

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Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 2

Texas Company Paint (Asphalt)

Pavers (Concrete) Koehring Co., Division of National Equip. Corp.

Perforated Metal

Chicago Perforating Co.
Cross Engineering Co.
Harrington & King Perforat-
ing Co.
Hendrick Mfg. Co.
Morrow Mfg. Co.

Plates (Double Corrugated) Hendrick Mfg. Co.

Pneumatic Drills (See Drills)

Portable Conveyors Barber-Greene Co. Fuller Company Link-Belt Co.

Portable Crushing and Screen- ing Unit Austin-Western Road Machy. Co. Good Roads Machy. Corp. Smith Engineering Works Williams Patent Crusher & Pulv. Co.

Powder (Blasting) Atlas Powder Co.

Pulverizers (See also Crushers, Mills, etc.) Allis-Chalmers Mfg. Co. Austin-Western Road Machy. Co. Babcock & Wilcox Co. Bonnot Company Bradley Pulverizer Co. Dixie Machy. Mfg. Co. Raymond Bros. Impact Pulv. Co. F. L. Smidth & Co. Williams Patent Crusher & Pulv. Co.

Pumps (Air Lift) Fuller Company

Pumps (Cement) Fuller Company

Pumps (Cement Slurry) Morris Machine Works F. L. Smidth & Co. A. R. Wilfley & Sons

Pumps (Centrifugal) Allis-Chalmers Mfg. Co. Kansas City Hay Press Co. Morris Machine Works A. R. Wilfley & Sons

Pumps (Dredging) Bucyrus-Erie Co. Morris Machine Works

Pumps (Pulverized Coal) Babcock & Wilcox Co.

Pumps (Sand and Gravel) Allis-Chalmers Mfg. Co. Kansas City Hay Press Co. Morris Machine Works A. R. Wilfley & Sons

Railway Equipment General Electric Co.

Railways (Electric) General Electric Co.

Rims (Wheel) Firestone Tire & Rubber Co.

Road Machinery Barber-Greene Co. Harnischfeger Corp. Koehring Co., Division of National Equip. Corp.

Rock Bits (See Drill Bits)

Rock Drills (See Drills, Rock)

Rod Mills Traylor Eng. & Mfg. Co.

Roller Bearings Timken Roller Bearing Co.

Roofing (Ready to Lay) Texas Company

Roofing and Siding (Steel) Joseph T. Ryerson & Son, Inc.

Rope, Wire (See Wire Rope)

Rubber Molded Goods Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Inc.

Sand Drag Smith Engineering Works

Sand Settling Tanks Link-Belt Co. Smith Engineering Works

Scrapers (Power Drag) Austin-Western Road Machy. Co. Harnischfeger Corp. Link-Belt Co. Sauerman Bros.

Screens Allis-Chalmers Mfg. Co. Chicago Perforating Co. Cleveland Wire Cloth & Mfg. Co. Cross Engineering Co. Harrington & King Perf. Co. Hendrick Mfg. Co. Industrial Brownhoist Corp. Link-Belt Co. Lorain Steel Co. Morrow Mfg. Co. National Wire Cloth Co. Nordberg Mfg. Co. Productive Equipment Corp. John A. Roebling's Sons Co. Smith Engineering Works Traylor Eng. & Mfg. Co. Universal Vibrating Screen Co.

Screens, Scalping (Hercules and Standard) Smith Engineering Works

Screens (Vibrating) Austin-Western Road Machy. Co. Link-Belt Co. Nordberg Mfg. Co. Productive Equipment Corp. Smith Engineering Works Universal Vibrating Screen Co. Williams Patent Crusher & Pulv. Co.

Screens, Washing (Hercules, Ajax and Standard) Smith Engineering Works

Screw Rewasher (Single and Twin) Smith Engineering Works

Scrubbers Hardinge Company, Inc. Lewistown Fdy. & Mach. Co. Smith Engineering Works

Seal Rings Traylor Eng. & Mfg. Co.

Separators (Slurry) F. L. Smidth & Co.

Shakers Ajax Flexible Coupling Co.

Shovels, Power (Steam, Gas, Electric, Diesel, Oil) Bucyrus-Erie Company Harnischfeger Corp. Industrial Brownhoist Corp. Koehring Co., Division of National Equip. Corp. Lima Locomotive Works, Inc. (Ohio Power Shovel Co.) Link-Belt Company

Silos F. L. Smidth & Co.

Skip Hoists and Skips Link-Belt Co.

Slings (Wire Rope) American Cable Co., Inc. American Steel & Wire Co. A. Leschen & Sons Rope Co. John A. Roebling's Sons Co. Williamsport Wire Rope Co.

Sockets (Wire Rope) American Steel & Wire Co.

Speed Reducers Ajax Flexible Coupling Co. Link-Belt Co. Traylor Eng. & Mfg. Co.

Steel (Abrasion Resisting) Joseph T. Ryerson & Son, Inc.

Steel Bars Timken Roller Bearing Co.

Steel (Bars, Shapes, Plates, etc.) Joseph T. Ryerson & Son, Inc.

Steel (Electric Furnace) Timken Roller Bearing Co.

Steel (Open Hearth) Timken Roller Bearing Co.

Steel (Special Alloy) Timken Roller Bearing Co.

Steel (Special Analysis) Timken Roller Bearing Co.

Stokers Babcock & Wilcox Co. Combustion Engineering Corp.

Tanks Combustion Engineering Corp. Link-Belt Co.

Tire Repair Materials Firestone Tire & Rubber Co.

Tires and Tubes Firestone Tire & Rubber Co. United States Rubber Co.

Track Equipment Lorain Steel Co. Nordberg Mfg. Co.

Track Shifters Nordberg Mfg. Co.

Tractors Kansas City Hay Press Co. Koehring Co., Division of National Equip. Corp.

Tramways (Aerial Wire Rope) American Steel & Wire Co. A. Leschen & Sons Rope Co. Macwhyte Company John A. Roebling's Sons Co. Williamsport Wire Rope Co.

Transmission Belting (See Belt- ing)

Transmission Machinery Allis-Chalmers Mfg. Co. Timken Roller Bearing Co.

Trenchers Barber-Greene Co.

Tube Mills (See Mills, Ball, Tube, etc.)

Tube Mill Liners (See Mill Liners)

Tubing (Blasting) Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Inc. United States Rubber Co.

Tubing (Seamless Steel) Timken Roller Bearing Co.

Underground Shovels Nordberg Mfg. Co.

Valves (Pump) Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Inc. United States Rubber Co.

Vibrating Screens (See Screens, Vibrating)

Washers (Sand, Gravel and Stone) Allis-Chalmers Mfg. Co. Austin-Western Road Machy. Co. Eagle Iron Works Hardinge Company, Inc. Link-Belt Co. Traylor Eng. & Mfg. Co.

Waste Heat Boilers Combustion Engineering Corp.

Weigh-Mix Koehring Co., Division of National Equip. Corp.

Welding and Cutting Apparatus General Electric Co. Harnischfeger Corp.

Welding Rod American Steel & Wire Co. Joseph T. Ryerson & Son, Inc.

Welding Wire American Steel & Wire Co. John A. Roebling's Sons Co.

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Wire Cloth Cleveland Wire Cloth & Mfg. Co. National Wire Cloth Co. John A. Roebling's Sons Co.

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Wire Rope Fittings American Cable Co., Inc. American Steel & Wire Co. A. Leschen & Sons Rope Co. Macwhyte Company John A. Roebling's Sons Co. Williamsport Wire Rope Co.

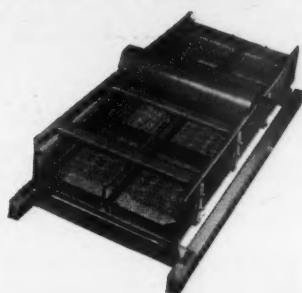
Wire Rope Slings (See Slings, Wire Rope)

Wire Rope Sockets (See Sock- ets, Wire Rope)

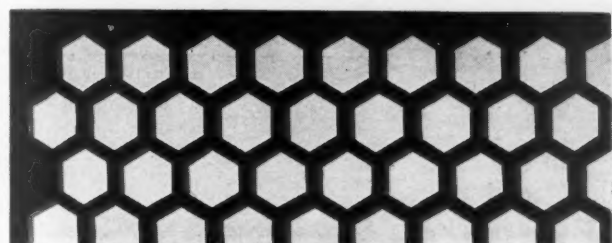
Let us WEIGH the EVIDENCE

In the matter of Vibrating Screens the evidence certainly favors the Late Model UNIVERSAL Super - Vibrator. The first cost results in an immediate saving of many dollars. The operator is assured of maximum capacity. Power consumption is lower because of the absence of power consuming gadgets. Upkeep is lower. There is the advantage of maximum accuracy of separations and a clean mesh to consider. These are not mere statements but FACTS backed by EVIDENCE furnished by the users—a very large percentage of whom consistently re-order UNIVERSAL Super-Vibrators because of their profitable experience with these dependable, lower priced screens.

If interested, ask us to send complete details.



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SCREEN CO.
RACINE, WIS.**



Proven Better

Results of actual installations in representative plants prove conclusively that the NEW CROSS HEXCREEN both increases capacity and gives a better, more uniformly sized product.

HEXCREENS combine round-hole accuracy with square-hole capacity. HEXCREENES have that well-known CROSS durability—ruggedness and wear-resisting features.

Let us also quote on CROSS standard screen plates or sections for all types of screens, Round, Conical, Shaker, Vibrating, in Special Alloy or CROSS S. A. steels, with any shape perforations according to your specifications.

Write for money
saving quotations.

CROSS ENGINEERING Co.

Manufacturing Plant and General Offices
CARBONDALE, PA.

Sales Representatives in Principal Cities



The MORRIS HYDRAULIC COLUMN

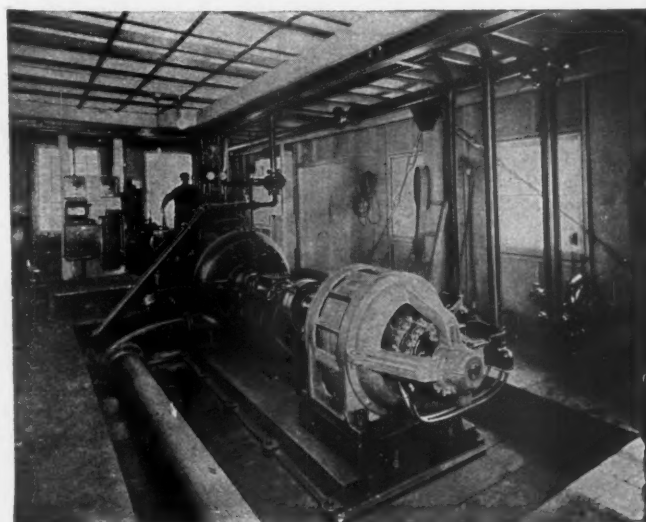
News of interest to Centrifugal Pump Users



RAPID subtraction—division
—addition—multiplication

The material in this sand and gravel deposit is subtracted from the pit, divided into two sizes of sand and three sizes of gravel, and added to the storage bins, all within a few minutes. The speed of these arithmetical processes, together with the steady multiplication of the profits of the plant, are due in large measure to the efficient equipment, which includes a Morris Hydraulic Dredge with an 8-in. Morris Manganese Steel Lined Dredging Pump, a 4-in. Morris Centrifugal Pump to prime the dredging pump and to furnish water for loosening up the deposit, and for caving the bank into the pit, and another 4-in. Morris Pump to supply wash water for the plant.

The experience of this plant with Morris Equipment is typical of the many hundreds throughout the country in which Morris Dredges and Centrifugal Pumps are helping to produce sand and gravel speedily and economically. If you are interested in more economical and larger production, write for bulletins describing Morris Dredges and Centrifugal Pumps.

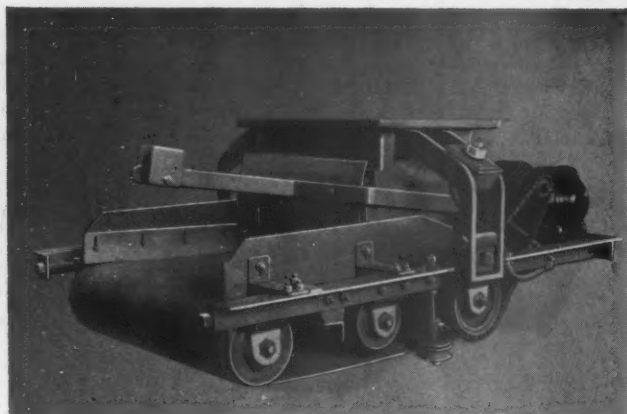


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"Really remarkable performance"; "not only satisfied but surprised"; "best on the market"; "entirely satisfactory in every respect"; "extremely gratifying results"—these are some of the concise comments which we continually receive from gratified sand and gravel producers concerning the operation and results obtained from other Morris Hydraulic Dredges. Morris Dredges can be furnished with standard, heavy-duty or lined dredging pumps; driven by electric motor, Diesel, gasoline or steam engine; with plain suction, revolving cutter or traveling screen on the suction; and for any special operating conditions. They have enabled sand and gravel companies to speed up production, reduce costs, and operate deposits which could not previously be worked by other equipment. Morris features of design and performance records are described in Bulletin 144—copies on request.

For authoritative recommendations on any pumping or dredging problems, write to Morris Machine Works, Baldwinsville, N. Y.
Export Office: 30 Church St., New York City

HARDINGE



FEEDERS

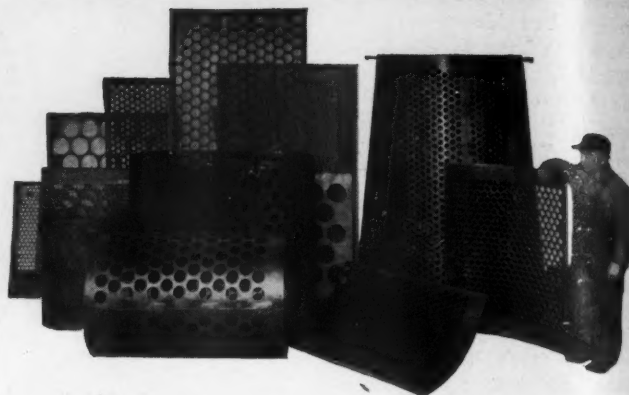
This simple, accurate, low cost Feeder will correct many present ills of grinding, drying and mixing operations. Tell us the type of Feeder you are now using—We will tell you what improvement you can expect with the Hardinge Constant Weight Feeder. Write for Bulletin 33C.

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For Sand, Gravel, Stone and Ore. Perforations of all standard types, also of unusual sizes and layouts to give large production and reduced screening costs.

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*"Turbulator
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Patented
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OUTSTANDING
because of
Sturdy Construction

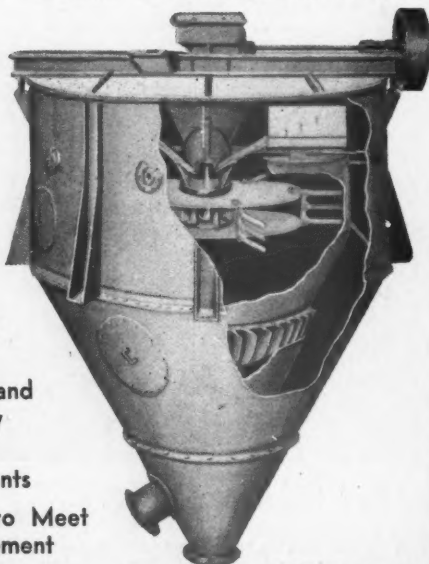
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Low Maintenance
Costs

Uniform Product and
Simple but Highly
Effective

Flexible Adjustments

Built in Sizes to Meet
Any Requirement

Investigate this New Model Air Classifier. Its great efficiency and ability to make a superior classification of particles is amazing.



BRADLEY PULVERIZER CO.

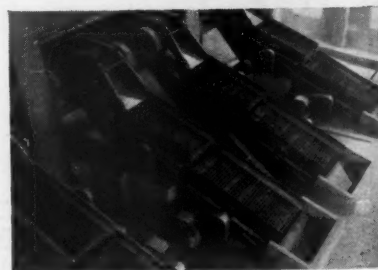
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and their
accessories

Gates
and
Feeders

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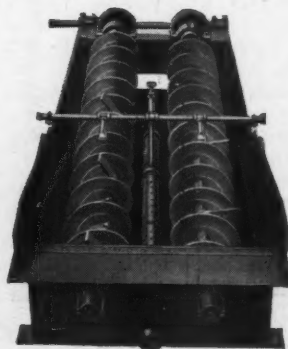


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EQUIPMENT

ROBINS CONVEYING
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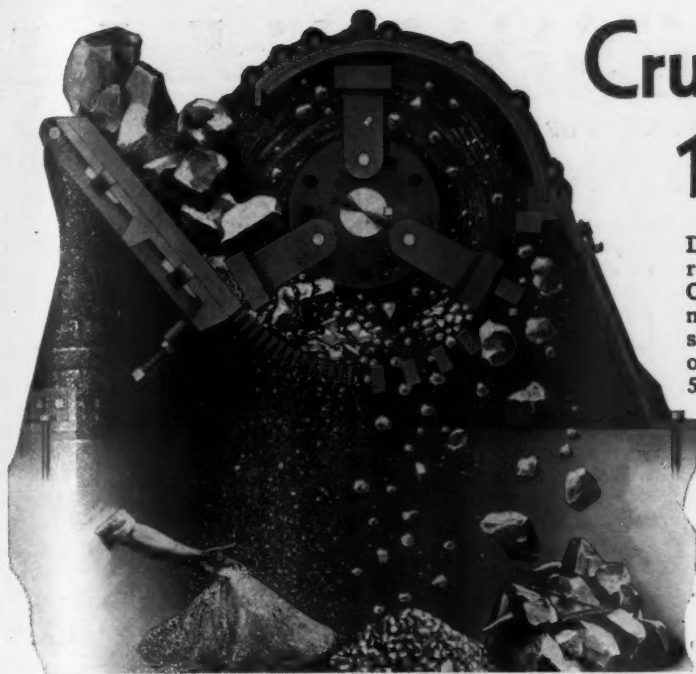


Single and Double
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Guaranteed removal of
trash, sticks, leaves, coal,
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clay-balls and iron
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Crushes 36" Rock to 1 $\frac{1}{4}$ " in One Operation

Due to their ability to handle power shovel loaded rock and reduce to commercial sizes in ONE OPERATION WITH ONE CRUSHER, Williams Hammer Crushers have shown remarkable savings in many quarries. By handling the large stone much sledging and secondary blasting is avoided. As only one crusher is required there is a saving in investment of 50% to 75% as you also save in smaller buildings, fewer foundations, conveyors, drives and motors. A cubular product free from slivers and slabs is another Williams advantage. Let us tell you about a Williams for your work. A size for every job. Capacities 3 to 300 tons per hour.

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LOWEST COST PER CUBIC YARD Excavates and Conveys Long Distances

Made in wide range of sizes for large or small operations.

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For digging from wet or dry deposit, for stripping, for stock-piling and re-claiming.



Can be used to extend reach of Crane or Boom Dragline.

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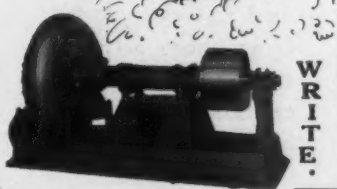
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Sand and Gravel PUMPS

High efficiency—low operating cost—precision workmanship—wear-resisting, non-heating bearings even when operated under extremely high heads.

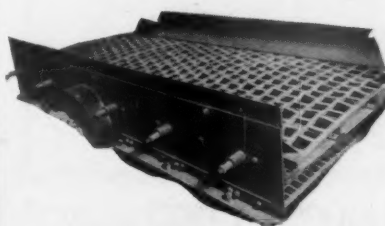
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The Equivalent of an Increased Capacity

HENDRICK DOUBLE Corrugated Plate



If you are not already enjoying the benefits from Hendrick Double High Carbon Heat-Treated Corrugated Plate, you can gain an in-

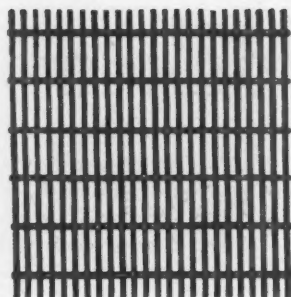
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Makers of Elevator Buckets of all types, Mitco Open Steel Flooring, Mitco Shur-Site Treads and Mitco Armorgrids. Light and Heavy Steel Plate Construction.



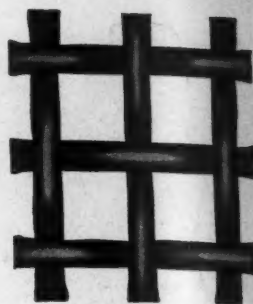
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BECAUSE MADE OF
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CLEVELAND, OHIO

**COSTS
LESS**

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ALL materials, fine or coarse, light or heavy . . . clay, gravel, sand, ores, stone, etc. . . yield to the wizardry of the mechanically-vibrated, Link-Belt Vibrating Screen, and classify themselves in strict accordance with their size. Its uniform vibration keeps the meshes open, and makes the screen's entire screening surface 100% effective. Send for Book No. 1462.

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5366

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MORROW

SCREEN PLATES

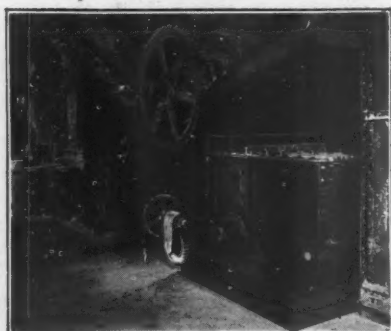
Perforated to meet your specific requirements in the sizing and preparation of coal, sand, gravel and other bulk material.

Perforations can be had in a wide range of sizes in round, square, oval and diagonal slots.

Being specialists in screening machinery is your assurance of entire satisfaction. Deliveries are prompt.

The Morrow Manufacturing Co.
Wellston, Ohio

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Put Your Reduction Problems Up to Us.

preparing "Easywork" Lime from R.O.K. Lump.

"Pennsylvania" STEELBUILT Primary and Secondary Crushers of the Single Roll, Hammermill and Jaw types are specialized for the preparation of Limestone for Stack and Rotary Kilns, for Cement Making, for Aggregate, and for Road Material.

Unbreakable Steel Construction
Positive Tramp Iron Protection

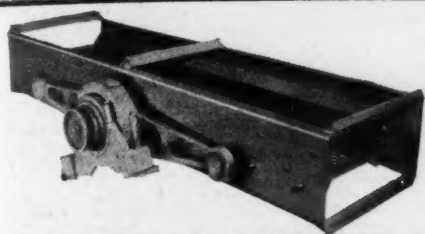
PENNSYLVANIA
CRUSHER COMPANY

Liberty Trust Building
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Branches in principal cities.

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... moves more tons with
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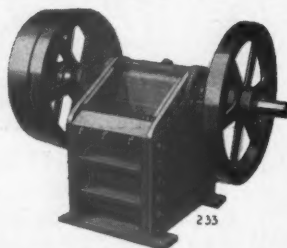
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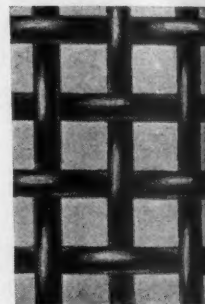
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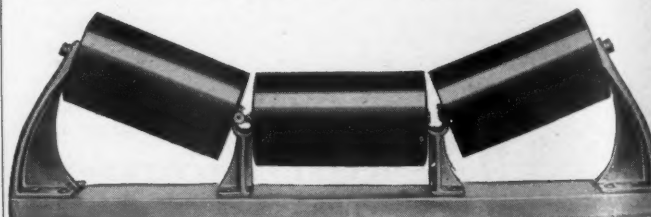
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One Lorain 75, 1 1/2-yd. dipper.
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Ring Roll Mills — No. 0 and No. 1 — Swing Hammer Mills.
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Complete drying and asphalt mixing plants.

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Continued from Preceding Page

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- 2—36"x54", 48"x72" Buchanan Jaw Crushers, all steel, Type C.
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- 2—3-roll Raymond high-side Mills.
- 3—5'x60' Allis-Chalmers Rotary Dryers.
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- 5—6'x60' Vulcan Rotary Kilns.
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- 1—7' Symons Cone Crusher.
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Single Chain Inclined Bucket Elevator, 65-ft. centers with belt feeder and 7 1/2 H. P. 3-phase electric motor; buckets 14" x 8", continuous type. Good condition, less than one year old. In service now, inspection by appointment.

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One complete 1 1/2 Cubic-yard Sauerman Power Drag Crescent Scraper with equipment necessary for operating on 700-ft. Span.
All absolutely new. Never used.

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- 1—New 1 1/2" dia. Track Cable, 924'-0 long.
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- 2—Sets Triple Sheave Blocks.
- 3—Winches for track cable.
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Multi cylinder 60 HP Diesel Engine. This equipment must be in good condition, ready to operate. Send full description with illustration. State location of equipment and if available for inspection.

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Portable and stationary, belt, with elec. or gas. power, sizes from 21 cu. ft. to 1,000 cu. ft.

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240—Buckets, all sizes and makes.

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Large lot including std. ga. 6 and 12-yd., and 20-yd., 36-ga. 5-yd. and 24-ga. 1½-yd. Also std. ga. flat cars and ballast cars.

48—Koppel Quarry cars 42" ga. 2½-yd. One way side dump.

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1—Stationary: Barber-Greene 18"x 10".

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1—American 15-ton gasoline powered locomotive crane on 8 wh. MCB trucks, 50 ft. boom. Model 158-G.

HOISTS

Gasoline, electric and steam. All sizes.

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1—Link-Belt K-55, Ser. 1450 comb. shovel and dragline, 70-ft. boom, 2-yd. Page bucket.

1—Northwest No. 5, Ser. No. 3430, 50 ft. boom; 1½-yd. dragline or clamshell; 130 HP. 6 cyl. Wisconsin accelerated control engine.

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1—Symons coarse cone crusher, size No. 5½, SU No. 521; capacity 450 tons per hour of 2½" material—130 tons per hour of ½" material; weight, 85,000 lbs.

1—Set Power and Mining Machinery Co. crushing rolls, size 42 in. x 16 in., rated capacity 15-20 tons per hour of ¾" material; weight, 41,000 lbs.

1—No. 6 Champion jaw crusher, No. U-1075-4; jaw opening 12"x 26"; capacity 24-35 tons per hour of 2" material; weight, 20,000 lbs. Like new.

1—Osgood heavy duty gas crane, No. 2054, 40-ft. boom, 1-yd. bucket.

6—1-yd. gasoline crawler type cranes. Northwest, Link Belt, P. & H., Brownhoist.

3—½-yd. Gasoline crawler cranes. Northwest, Brownhoist and Thew.

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Steel and wood, stiff leg, or guy; from 5 to 50 tons, including 3 steel stiff legs; 1—20-ton Terry 100 ft. boom; 1—10-ton Insley 80 ft. boom and 1—10-ton American, 80 ft. boom.

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3—Gardner Denver wagon or derrick drills with Model 21 or 17 Gardner drills for channelling.

25—Ingersoll-Rand and Sullivan jack-hammer column and tripod drills.

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32—Gasoline locomotives from 14-ton to 2-ton, std. 36 and 24-ga.

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1—24-ton Porter steam, saddle tank, cyl. 12"x16" st. ga. Serial No. 5093.

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All sizes and types, both force, centrifugal and steam.

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1—Osgood comb. heavy duty 1-yd. gas. shovel and crane, No. 2069.

1—Model "00" Thew crawler mounted gas. shovel with ½-yd. dipper.

1—Bay City tractor shovel No. 947, ¾-yd. dipper, ¾ circle swing.

1—Link Belt K-55 Diesel No. 1450, 70 foot boom, 2-yd. dragline bucket and shovel front with 2-yd. dipper.

Also Link Belt Shovel attachment for Models K-55, K-44, K-42, K-38 or K-2.

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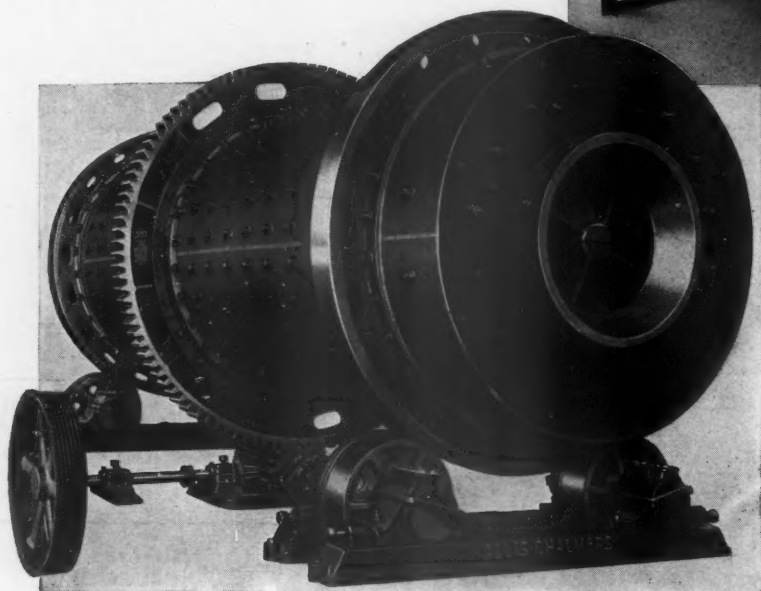
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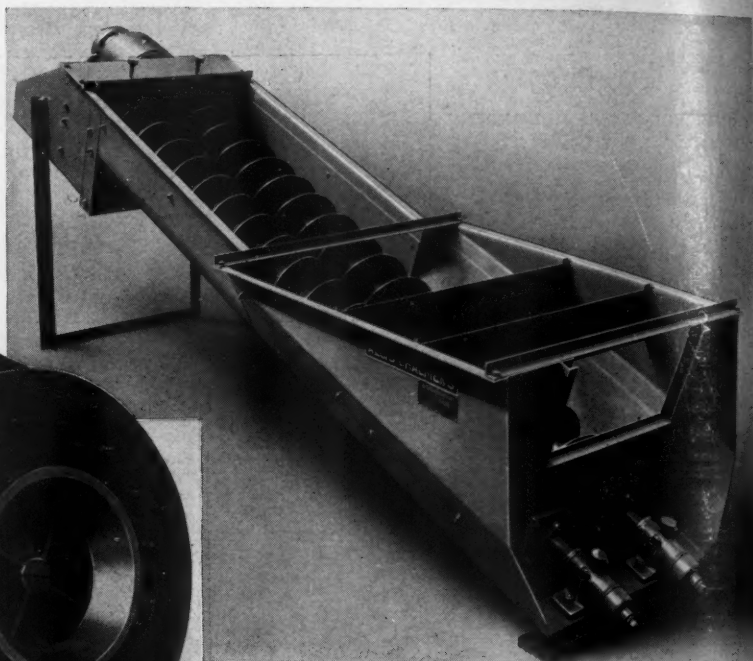
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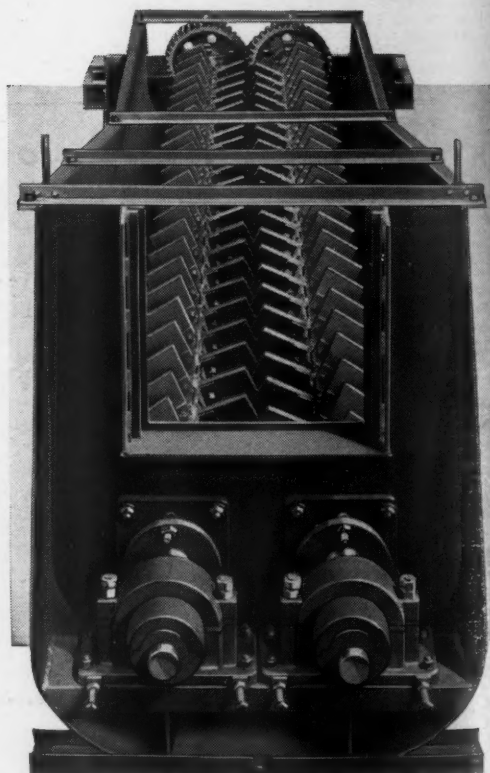
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